SYNOPSIS

OF

PRACTICAL PERSPECTIVE,

LINEAL AND AERIAL,

WITH

REMARKS ON SKETCHING FROM NATURE,

&c. &c.

BY

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"The rules of art are not the fetters of genius, they are fetters only to men of no genius."
Sir Joshua Reynolds.

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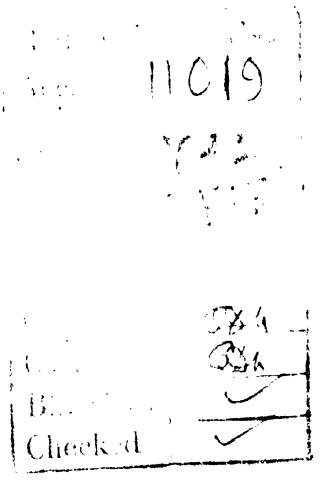

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DIRECTORS

FOR MANAGING THE AFFAIRS

OF THE

Honourable East-India Company,

THIS WORK

ON LINEAL AND AERIAL PERSPECTIVE,

IS,

WITH DEFERENCE AND RESPECT,

DEDICATED

MOST OBEDIENT HUMBLE SERVANT,

T. H. FIELDING.

LONDON, *Jan.* 1843.

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PREFACE.

In the following work the Author has endeavoured to arrange a concise System of Perspective that may equally serve the Teacher and Pupil, omitting theoretical reasoning, and trusting for conviction to the plain demonstration of facts. Sir Joshua Reynolds observes, in his excellent Discourses on Painting, that a "degree of mechanical practice, odd as it may seem, must precede theory. The reason is, that if we wait till we are partly able to comprehend the theory of art, too much of life will be past to permit us to acquire facility and power; something, therefore, must be done on trust, by mere imitation of given patterns, before the theory of art can be felt."

Notwithstanding there are extant many valuable works on this science, very few are sufficiently free from irrelevant matter to enable the student to come immediately to the point required, *viz.* the simplest mode of working a question; and many have their plates on so small a scale, that however good they may be in other points, it is impossible to introduce the minuter details with any chance of perspicuity.

The Author has had the whole of his own diagrams engraved upon separate plates; thus obtaining undivided attention for each, by avoiding that great

inconvenience which frequently occurs to the student, when more than one figure meets the eye at the same moment: but those few which have been borrowed from others he has arranged with a greater view to the economy of space, as they may be found separately in the respective works from which they are taken, and which are duly acknowledged in their proper places.

In the Second Edition more was added to the historical division of the subject in the Introduction: a new plate and chapter on the Perspective of Colours; as much notice of the Perspective of Shadows as appeared necessary; a new plate illustrative of Aerial Perspective, and an Appendix of Notes too extended to be embodied in the work. Some few errors also which had escaped notice in the former Editions have been carefully rectified in the present; should any yet remain, they are of so trifling a nature as to be within the correction of an attentive reader.

This work having now been used during many years as a class-book at the Honourable East-India Company's Military College, the Author is enabled to judge of its utility, and finds it not necessary or advisable to make any alteration in this, the Third Edition, as it contains a compendium of all that is required in perspective equally suited to the purposes of the student, the amateur, the architect, and the artist.

SYNOPSIS

PRACTICAL PERSPECTIVE.

INTRODUCTION.

PERSPECTIVE is the science by which we are enabled to represent upon a plane the perfect appearance of all visible objects, and may be divided into two parts: first, Lineal Perspective, regulating the forms of objects; second, Aerial Perspective, relating to their colours, lights, and shadows.

At what era Perspective became an organized science it is difficult to conjecture; but we may safely infer, that the ancients knew sufficient of its principles to aid them in the construction of scenery for their dramatic performances, from the statement of Vitruvius, although he is the only author who gives any positive information as to its antiquity. He

mentions, in the preface to his seventh book, that when Æschylus was about to exhibit a tragedy, he gave instructions to Agatharcus for the preparation of the scenery.

Agatharcus commenced by writing a treatise on the subject, which he communicated to his pupils, Anaxagoras and Democritus, who treated the science more distinctly than had been done by Agatharcus; they explained the manner in which all lines were to be governed by the points of sight and distance, as to a centre, so as to gain the appearance of realities upon a plane surface; but their writings have shared the fate of many other excellent works, and are now unknown.*

It is much to be regretted that the industrious Pliny should not have handed down to us what was known on the subject of Perspective in his own times, instead of the amusing, but somewhat doubtful, anecdote of the crows being so deceived by some paintings used in the plays given by Claudius Pulcher, that they attempted to perch on the pictured roofs of the buildings in the scenes.

When we consider how far advanced the ancients were in Geometry, in Sculpture, in Painting, and in Architecture, we have every reason to believe that

* See Appendix, Note A.

Perspective was equally well understood by them; for it cannot be supposed that an art so essential to the perfection of Painting should be neglected, at a time which displayed those splendid examples of human genius produced by the fostering patronage of Pericles. The objection that the paintings discovered in the baths of Titus, and at Rome, do not evince any great progress in the knowledge of perspective, is not more valid than a similar one would be, should future ages dispute the pictorial and perspective knowledge of the present day, on considering some specimens of papering or other decorations of houses, that might happen alone to escape for a long period the general ravages of Time; nor can we believe that the works of many of the ancient artists would have been so extolled, or would have sold at such astonishing prices, had they not possessed very much of the merit ascribed to them, or had they erred in the first principles of their art.

John Van Eyck, born at Maaseyck on the Meuse, in 1370, is one of the earliest mentioned cultivators of perspective since the revival of Painting, in which he is stated by Bartollomeo Bramantino to have been almost unrivalled, an assertion ably supported by his paintings. It is to Van Eyck that we are said to be indebted for the discovery of painting in oil;

perhaps, more properly, for adapting the discovery to works of greater delicacy than those for which it had hitherto been used, as we find in a work by R. E. Raspe, published 1781, called "A Critical Essay on Oil Painting," that there were still existing MSS. in the libraries at Wolfenbuttle, Leipzic, Paris, and at Cambridge, in which their authors shew that the use of linseed oil in the mixture of colours was known about 800 years since, as one of the writers lived about the year 1000, and in our own Exchequer Rolls we find, also, bills of charges on account of oil supplied to the painters, a full century previous to the time named as the epoch of the invention by Van Eyck.

Amongst the oldest writers who have prescribed certain rules of perspective, we find Bartollomeo Bramantino, of Milan, whose work is dated 1440, and Pietro del Borgo, who adopted the correct idea of giving the representation of objects as seen upon a transparent tablet placed between the spectator and the object. Pietro del Borgo, sometimes called Pietro Borghese, or Della Francesca, was born in Urbania, 1398. He is celebrated for his knowledge of perspective and geometry, and a drawing of a splendid vase is mentioned, in which he contrived, by reflections, to shew the mouth, the bottom, as well as its

whole circuit, in a series of circles most correctly and gracefully drawn and fore-shortened. Bramantino living at the same time, and also in Urbino, with Borgo, must have profited by his instructions, as well also by seeing his works and his writings; nor is it at all improbable but that the system of Borgo (whose work is not extant) is the same that Serlio published in 1540, as the method used by Serlio is taken from Peruzzi, of Sienna, who had attentively studied the writings of Borgo; and it is either to the latter or to Peruzzi that we are indebted for the discovery of points of distance, the use of which have been so elegantly exemplified in some of the diagrams of Jehan Cousin, the earliest French writer on this science (his first work is dated 1560). But it was not until about the commencement of the seventeenth century that those principles were elaborately explained by Guido Ubaldi, upon which Dr. Brook Taylor afterwards founded his condensed work on Perspective.

Although Painting at this time (circa 1450) was defective in many points, particularly in colouring, which was of a cold and sombre character, yet in perspective the improvement had been great, both in execution and in writings on the subject; indeed so great, that Lomazzo was induced to observe that

design was the chief excellence of the Romans, colouring that of the Venetians, and perspective the principal perfection of the Lombards; he adds in his Treatise on Painting, p. 405, "In this art of correctly viewing objects, the great inventors were Giovanni da Valle, Constantino Vaprio, Foppa, Civerchio, Ambrogio, Philippo Bevilacqui, and Carlo, all of them belonging to Milan; add to these Fazio Bembo da Valdarno, and Christoforo Moretto of Cremona, Pietro Francesco of Pavia, and Albertino da Lodi, who, besides the works they produced in other places, painted for the Corte Maggiore, at Milan, those figures of the armed barons in the time of Francesco Sforza, first Duke of Milan, between the years 1447 and 1466."

These improvements were not allowed by the Italians to lie idle. Perspective was cultivated during the fifteenth century as an adjunct only to historical painting; after this period it was pressed into more active service, and became a grand source of amusement in perfecting and adding finish to their religious festivals, their theatres, and civic and military processions. "Spectacles of these kinds became afterwards more common to the people" (we borrow from the Abbé Lanzi), "for the Medici, in commencing their domination over a people whom they feared, affected

popularity, like the Roman Cæsars, by promoting public hilarity. Hence, not only on extraordinary occasions, such as the elevation of Clement VII. to the papal chair, of Alexander and of Cosmo to the chief magistracy of their country, on the marriage of the latter, on that of Giuliano, and of Lorenzo di Medici, and on the arrival of Charles the Fifth; not only on such occasions, but frequently at other times, they instituted tournaments, masquerades, and representations, of which the decorations were magnificent. In this improved state of every thing conducive to exquisite embellishment, industry became excited, and the number of artists increased. Amongst those most in request was Bastiano di Sangallo, more frequently called Aristotile; his perspectives were in great request in public places; his scenes in the theatre. The populace, unaccustomed to those ocular deceptions, were astonished; and it seemed to them as if they could ascend the steps, enter the edifices, and approach the balconies and windows in the pictures. The long life of Aristotile, coeval with the best epoch of Painting, permitted him to serve the ruling family and his country until his old age, when Salvate and Bronzino began to be preferred to him: he died in 1551."

There are yet remaining some ancient specimens

of this taste for enlarging the appearance of halls, colonnades, &c. An example of the former, although not one of the best, may be seen in the banquetting-hall at Penshurst-place, near Tonbridge, the ancient seat of the celebrated Sydneys.

Daniello Barbaro, who published a work on Perspective in 1669, at Venice, would lead us to believe that there have been some valuable methods of perspective in use since the revival of the art, which had not reached his own era. "In this art," he says, speaking of different artists, "they left many fine remnants of excellent works, in which we behold not only landscapes, mountains, woods, and edifices, all admirably designed; but even the human form, and other animals, with lines drawn to the eye as to a centre, and placed in the most exact perspective. But in what manner and by what rules they proceeded, no author of whom I am aware has left any account to instruct us." It certainly would be not a little interesting to learn whether systems or modes used so lately as the fourteenth century can have been so entirely swept away with their inventors; for notwithstanding the great perfection to which perspective has been brought in our own times, there yet remain a few desiderata; such, for one example, is the following:

If a straight line of lofty-rigged vessels, and of the same height at sea, are seen to the right or left hand of a spectator, running out to the horizon at a right angle with the plane of the picture, they must have their vanishing point in the point of sight: but on account of the convexity of the world, the hulls of the vessels would begin to disappear at about three miles if seen by a man of six feet height, standing on the same level as the sea.* Thus the upper masts would be visible a long time after the hulls had gone down below the horizon, apparently making requisite two or more vanishing points for lines in the same vertical plane, and under similar circumstances, for planes parallel to it, which none of our systems of perspective have yet been able to provide for.

In the foregoing enumeration of writers on perspective, we have chiefly followed the Italians, as, generally speaking, they appear to have been the precursors in most departments of painting; other nations have furnished their quota. Even the Ara-

* When the sight is placed twenty feet above the level plane of the earth, the spectator will see to a distance of about $5\frac{1}{2}$ miles :—

40	feet will give about	$7\frac{2}{3}$ of a mile.
50	ditto.....	$8\frac{3}{4}$ ditto.
100	ditto.....	12 ditto.
1000	ditto.....	$38\frac{2}{3}$ ditto.
4000	ditto.....	$77\frac{1}{3}$ ditto.
4350	ditto.....	80 miles.

bians were not ignorant of the rules of perspective, as may be gathered from a work by Alhazen, on Optics; he lived about the year 1100, and his work is quoted by the celebrated Roger Bacon, who also wrote on Perspective with more accuracy than could have been expected. Many have written well and to the purpose in Latin, German, Dutch, French, and English, but our limits will not allow us to go into their various merits.

The following is a list of a few of the earliest writers, with the date of their works, when published. In Latin: Johannes CANTUARIESENES Perspectiva; Pisa, 1508, folio. C. VITELLIONIS, de Natura, Ratione, et Projectione Radiorum, Luminum, Colorum, atque Formarum, quam vulgo Perspectivam vocant, libri x. Norimb. 1551, folio. Joa. Fra. NICERONI, Taurmaturgus Opticus, studiosissimus Perspectivæ, Paris, 1638, folio. Guido Ubaldus, Perspectivæ, 1600, folio. In English: Practical Perspective made Easy, by Mason, 1680, folio, appears to have been the first attempt in our own language. In German: "*New Perspective, or the true Foundation of the Arts of Design,*" by Gualt. Hen. RIVIUS, 1547, folio, Nuremberg. Also, a work prior to this, in the year 1509, called "*Of Perspective as it regards the Arts,*" folio, John LAUTENSACK; "*Instructions on the Use of the Compass and Rule, particularly on Perspective,*" Frankfort, 1567,

folio; and many others. In French, we find many writers on this art, of whom J. Cousin is the oldest; and some few in Dutch; the first mentioned appears to be John Fries VREDEMAN, London, 1559, and in folio at Amsterdam, 2 vols. 1633.

Since the authors above mentioned, much has been written on this subject by geometricians and others in our own language. Some of them display great ability, but have little or no reference to Painting, an art and science that has been classed, by the illustrious of all ages, amongst the most valuable of those that are termed elegant; and for its utility, certainly worthy of the great encouragement given to it by every enlightened nation; and the following extract from Carver's Travels in North America, shews an adaptation of drawing to a serviceable purpose scarcely to have been looked for amidst savages:—"When Carver went up the Chippaway river, in his progress to the Lake Superior, his guide, who was a chief of the Chippaways, fearing that some party of the Naudowessies, with whom his nation are perpetually at war, might fall in with them and do them some mischief before they could be apprized of Carver's presence in the party, took the following steps. He peeled the bark from a large tree, and with wood-coal mixed with bear's grease, made, in an uncouth but expressive

manner, the figure of the town of the Ottagaumies. He then formed a man dressed in skins, by which he intended to represent a Naudowassie, with a line drawn from his mouth to that of a deer, the symbol of the Chippaways. After this, he depicted a canoe as proceeding up the river, in which he placed a man sitting with a hat on; this figure was designed to represent an Englishman, or Carver himself; his French servant was drawn with a handkerchief tied round his head, and rowing the canoe. To these he added several other significant emblems, among which the pipe of peace appeared painted on the prow of the canoe. The meaning he intended to convey to his enemies, and which there is no doubt was perfectly intelligible to them, was, that one of the Chippaway chiefs had received a speech from some Naudowassie chiefs at the town of the Ottagaumies, desiring him to conduct the Englishman who had lately been among them up the Chippaway river; and that it was required that the Chippaway, notwithstanding he was an avowed enemy, should not be molested by them on his passage, as he had the care of a person whom they esteemed as one of their own nation." It is remarkable how closely this description agrees with a plate in Lord Kingsborough's splendid and elaborate work on Mexican Antiquities,

by which we learn that the Mexicans had, from remote times, reduced painting into an historical language. The plate alluded to describes a series of adventures in a manner so detailed (and it may be presumed correctly) that it is worthy of particular attention.

The principal beauties in painting depend much on that intellectual relish or discernment called taste, a word difficult to define, but well understood by the mind in its cultivated state.

Perhaps, with relation to Painting, we may call it that power of the soul which produces the greatest effects, in a natural and graceful manner, by the least apparent exertion, the smallest number of agents, and those of the simplest qualities. Yet the finest taste is insufficient without a knowledge of the rules of art; and for the foundation of pictorial skill, as well as for the formation of a correct judgment, an acquaintance with perspective is absolutely essential: in short, a composition in writing orthographically incorrect, would not be more faulty than a drawing in which the rules of perspective have been transgressed.

It is not unfrequent to see objects in drawings so defective, that what should appear a large house, becomes too small to be inhabited, or a cottage with a door ten or twelve feet high, owing to the dis-

proportion of the objects about them; and occasionally a road over a bridge three or four times the breadth of the arches which have to support it; or figures on the sea-shore, taller than the mast of a vessel placed at an equal distance from the eye of the spectator, &c. &c.

Until perspective shall be considered among the first steps in learning to draw, such errors must continually offend, not only the judgment of the well-informed, but even the uncultivated observer will, on inspecting such pictures, feel that all is not right, although his ignorance of the art prevents him from pointing out where they may be wrong. We cannot but be of opinion, that much has been done to prevent the general study of perspective by the too great zeal of most writers on the subject. Some have unnecessarily made, what is in fact a very plain subject, into one of vast and complex importance; and more injury has been frequently done by proving too much than too little. One of our best writers * has put forth so large a folio, and given example upon example so multiplied and interwoven together upon the same plate, that an eye already well accustomed to such intricacies is required to unravel them; of course, the number among the uninitiated

* Malton, sen.

must be small who are willing to devote the time requisite for their disentanglement. Another excellent writer * has erred in a different way: his book is small, and his mode of explanation is so brief, and at the same time so learned, that it loses very much of its general utility; had he written in one of the dead languages, he would not have had fewer readers.

A few have attempted a compromise between truth and error, by using expedients to avoid the inconvenience that will sometimes arise from the strict rules of perspective when an improper choice of station has been made. These expedients, to say the least, are unscientific, for there can be no other mode of perspective worthy of the name than that which is of the strictest mathematical construction.

Andrea Pozzo, who published a work on Perspective at Rome, in two volumes folio, A.D. 1693, has made so just a defence of mathematical perspective, that we are induced to give an abridged translation of the passage:—"Since perspective is but a counterfeiting of truth, the painter is not obliged to make it appear complete when viewed from any position, but from one determinate point only. If several points of sight are assigned in one subject, there will be no place whence you may get a perfect view of

* Dr. Brook Taylor.

the whole; and, at best, you can but view each part from its own particular point. Therefore, if, through the irregularity of the place, the architecture and figures intermixed should seem any thing lame when viewed out of the proper point, it is so far from being a fault, that I look upon it as an excellency in the work, that when seen from the point determined, it appears with due proportion, straight, flat, or concave, when, in reality (*on the picture*) it is not so."

It is only by objects that are reducible to rules that we can be made to comprehend how rules might be supposed to operate upon things which are wholly beyond their reach, or so nearly so, as to make the result scarcely compensate the labour it would cost to bring them within those rules. We may understand how such irregular subjects as trees, figures, cattle, waves of the sea, &c. are affected by the ordinances of perspective, by having previously learned in the diagrams of more regularly formed objects, that the most minute recession will give a corresponding perspective decrease, according to the immutable law, that all things appear to diminish by distance. "The smallest angle under which an object may in general be viewed is about a minute. This angle gives for the greatest distance at which

a strong eye may discern that object, 3,450 times its diameter. For instance, an object one foot in dimension becomes invisible at 3,450 feet distance; and a man five feet in height is precluded from our view at five times that number of feet, that is to say, 5,730 yards (about three miles). This calculation is for common daylight: but if we would take our visual powers at the utmost, we must select an opportunity when they are surrounded by obscurity and the object inspected by light. As, for instance, a light of an inch diameter is discernible by night at about ten times the distance at which by day we could discern a foot diameter; consequently vastly beyond its daylight vanishing station, which is little more than four hundred yards."—*Fitzgerald on Painting.*

If some of the tortuous branches, the advancing nodes, and deep receding sinuosities of old trees, might be executed by those who, in addition to skill, possess much time and perseverance; to represent, according to rule, their clusters of leaves, with the endless ramification of the branches upon which they are placed, is an attempt not within the sphere of a diagram, and must be left to the pencil of those who have attentively sketched from nature.

In no department of painting does perspective add more to the beauty of the performance than in por-

traits; and here, as in the preceding case, it must be left to the hand and eye. When a face is represented fronting the spectator, there is little more to remark than its height above or below the horizontal line, as the lines upon which the eyes, eyebrows, mouth, &c., are placed being parallels, such a position gives them no tendency to unite, or, in other words, to run to a vanishing point; but when one side of the face is turned from the spectator, it becomes apparently smaller than the side which is nearest, consequently those lines lose their parallelism, and would unite, if continued, in a point which would be called their vanishing point. It is by an exact attention to this that a singular charm is given to the portraits of the best artists. A learner would feel shocked at the idea of making one eye larger than the other, or a greater space between the eye and mouth on the nearer cheek than on the farther; yet very little instruction is necessary to shew its necessity: and a moderate degree of practice will also shew, that no grandeur or delicacy of expression can be obtained without an exceedingly minute observance of the laws of perspective. If a hand be advanced, it is to be drawn larger than the hand which retires. The same attention is to be carried to the feet, and every other part of the figure. For

this purpose the knowledge requisite can only be acquired by going through the diagrams of more formal subjects, and thus fixing in the mind those precepts which require that a pencil should not be moved without a perpetual recurrence to them: afterwards it will not be difficult to gain all that can be wished by drawing from nature, a practice *of* the very first consequence.

To many the power of sketching freely and correctly is of great value; but moments may occur when, to those in the military or naval services, it might prove of infinite use. A faithful drawing is a written language that all can understand: it will often, at a single glance, convey more intelligence than hours of conversation or numerous pages of writing; and, in this persuasion, the Author feels that he cannot too strongly recommend the study of perspective, as one of the first and most important steps towards the attainment of an art of such extensive utility.

DEFINITIONS.

HORIZON, or HORIZONTAL LINE, is a line drawn through the picture, the height of the observer's eye. Of course, the horizontal line would be proportionately lower to a person sitting than to one standing at the same station.

STATION, is a point on the ground plan representing the position of the observer.

POINT OF SIGHT, is a point on the horizon opposite to the observer's eye, and is marked in the picture by a perpendicular line drawn from the station to the picture. In parallel perspective this is the principal vanishing point.

VANISHING POINT, is any point on the picture where two or more lines will unite, the originals of

which are parallel to each other, and placed at an angle with the picture. Vanishing points are formed by lines drawn from the observer or station parallel to the side of the object for which a vanishing point is required, till they cut the picture or plane of delineation. The intersection is the vanishing point.

Note. All objects whose sides are parallel have the same vanishing point.

VANISHING LINE, is any line on the plane of the picture, in which the representation of original planes parallel to each other appear to meet or concentrate.

VISUAL RAYS, are supposed lines proceeding from the eye to every part of the object or objects under view, forming a cone. A section of this cone made perpendicularly to its axis, by the introduction of a supposed plane, would give the perspective representation of the object or objects viewed.

Note. The supposed plane is the picture.

GROUND PLAN, is a regular plan of the objects to be drawn, made according to a scale, and placed at the angle or angles they make with the picture.

ELEVATION, may be called a plan of the front or

sides of buildings or other objects, made according to a scale. Such drawings as are used by architects and builders are called plans and elevations.

BASE LINE, is the bottom of the picture.

LINE OF CONTACT, is a line upon which all real heights of objects are marked, according to a scale, and carried thence into the perspective work, by lines, to the respective vanishing points.

Note. This line is produced by continuing one of the principal sides of an object till it touches the picture. The point of contact is transferred to the base line, and a perpendicular formed upon it for the line of contact.

PICTURE, — PLANE OF DELINEATION, or TRANSPARENT MEDIUM, — is a supposed plane between the observer and the object to be represented. The transparent plane or picture is always supposed to be placed at right angles with the line that bisects the field of view, or the angle made at the eye by the extent of the subject or country intended to be represented. The bisecting line is the shortest visual ray to the horizon, and marks the point of sight upon it.

POINT OF DISTANCE, is a point set off on either or both sides of the point of sight upon the horizontal line, and represents the distance of the spectator from the plane of the picture. This distance should not be less than the whole length of the picture.

DESCRIPTION OF THE PLATES.

PLATE I.

It is required to find the perspective appearance that a cube would make, supposing it to be placed with both its sides inclined to the picture or plane of delineation.

Draw the ground plan at the given distance from the picture and at the angles made with the picture by its sides, continuing one of them to the intersection at 5, in the upper figure upon the line marked *picture*. This is the point of contact. Draw also the elevation of one of its sides, which, being equal, will represent them all. From the station carry a line perpendicular to the picture, which at the angle 2 will mark the point of sight. Carry also from the station two lines parallel to the sides of the cube until they cut the picture for the two requisite vanishing points.

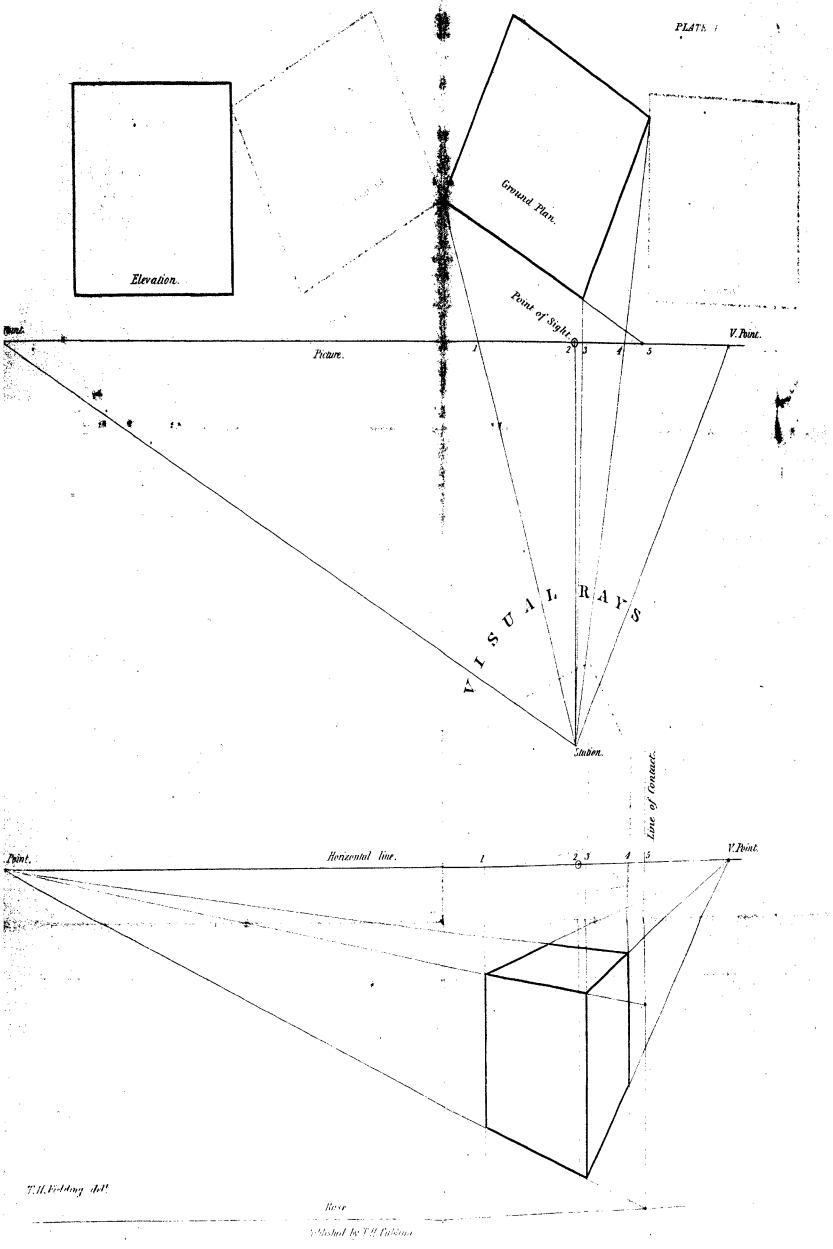
PLATE I
Elevation.
Ground Plan.
Point of Sight.
V.Point.
Picture.
1
2
3
4
5
VISUAL RAYS
Station.
Line of contact.
Horizontal line.
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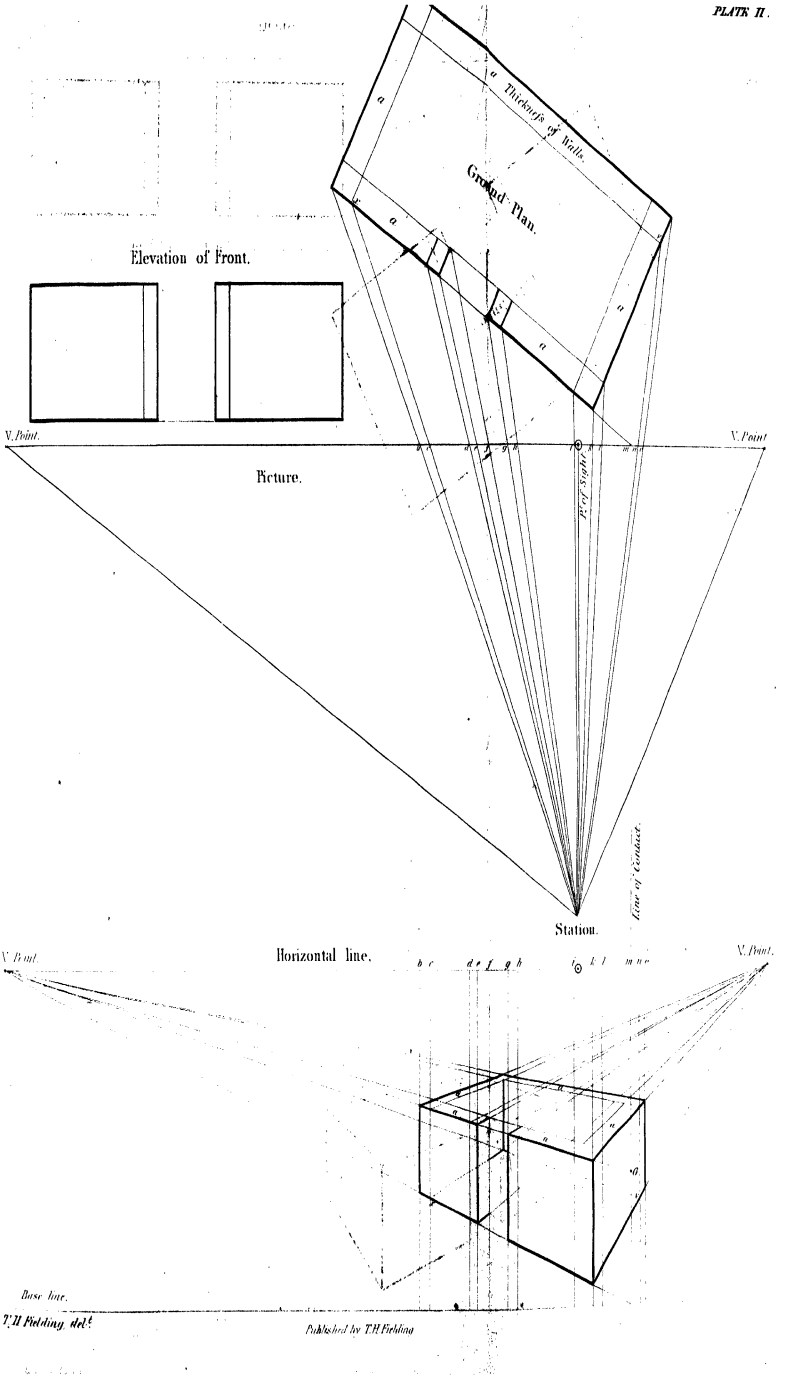
Lastly, draw the visual rays, 1, 3, 4, from the three angles of the ground-plan to the station. The second part of this diagram is to be placed below the ground-plan at a convenient distance, and is commenced by drawing the horizontal and base lines parallel to each other; the perpendiculars, 1, 2, 3, 4, 5, and the two vanishing points, in the order and at the same distances that they are placed from each other in the work of the ground-plan above. Mark the height of the elevation on the line of contact 5, measuring from the base line. From the point on the line of contact which marks the height of the elevation, and also from the bottom of the line of contact, draw two lines to the left-hand vanishing point. Thus the top and bottom of the cube on that side will be obtained by the upper and lower intersections of the perpendiculars 1, 3. Two other lines carried from the upper intersections of the perpendiculars 1, 3, to the vanishing point on the right, and also a line from the lower intersection of the perpendicular 3 to the same vanishing point, will complete the two visible sides. There will then only remain wanting a line to finish the top: this is to be drawn from the upper intersection of the perpendicular 4 to its proper vanishing point, and the desired figure will be complete.

PLATE II.

It is required to give the perspective delineation of an open building with a door-way in its front; the sides and ends inclined to the picture. The whole to be placed below the horizontal line, that the thickness of the walls may be seen on the top.

This is an exercise on the preceding plate with additional lines on the ground-plan *a. a. a. a. a.* laid down for the thickness of the walls. These lines are to be carried to the outer edge of the ground-plan, and from their points visual rays are to be drawn to the station; also visual rays from those lines, which denote the width of the door-posts, as shewn in the elevation, and from the point which marks the depth of one of them in the wall. The whole of the intersections are next transferred from the line denoting the *picture* to the base line in the lower part of the plate, upon which perpendiculars are to be raised to the horizontal line. The height


Thickness of Walls.
Ground Plan.
Elevation of Front.
V. Point.
V. Point
Picture.
Ray of Sight.
Line of Contact.
Station.
Horizontal line.
V. Point.
V. Point.
Base line.
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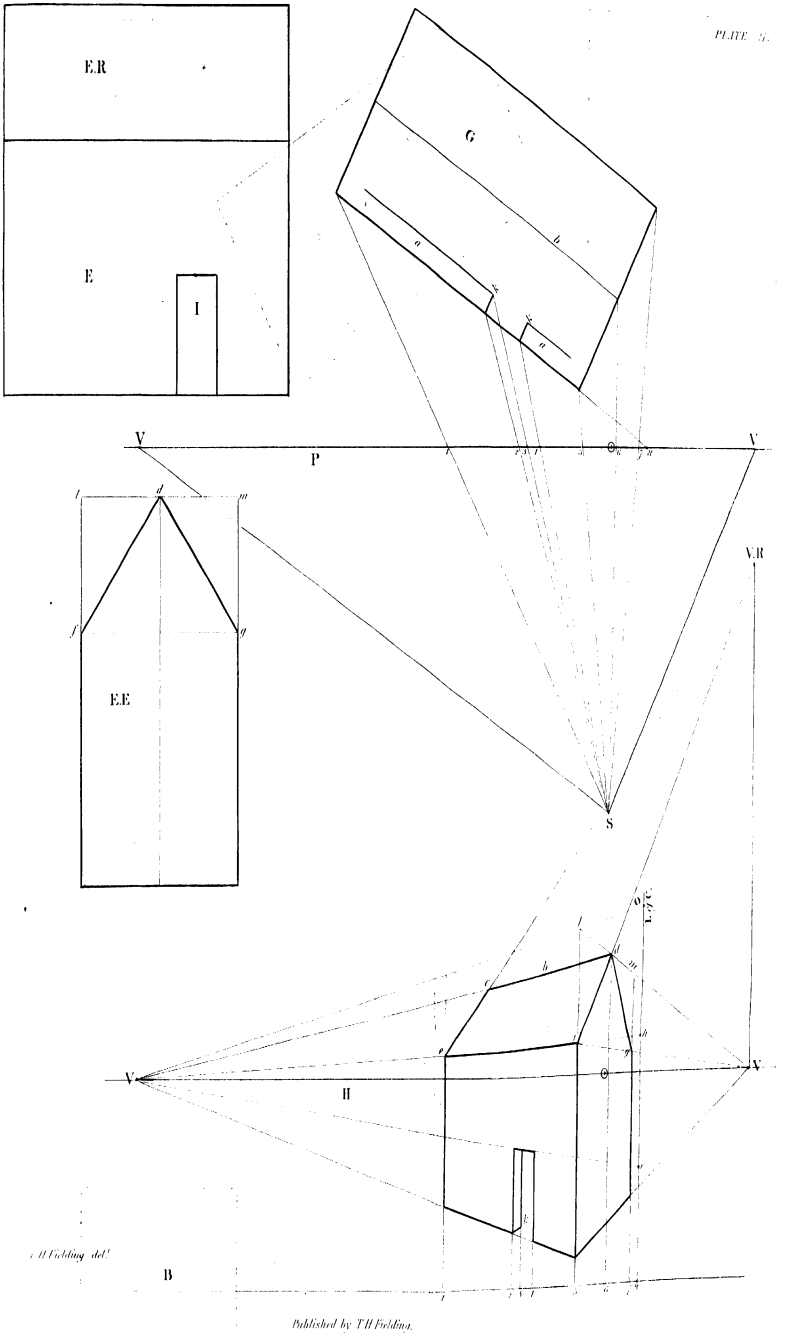
of the building is then taken from the elevation and placed on the line of contact at 6, and a line drawn thence to the vanishing point on the left, with another from the foot of the line of contact to mark the lower part of the building. From all the different intersections of the perpendiculars, lines must be produced to their respective vanishing points, which by crossing each other will give the perspective thickness of the walls.

PLATE III.

THE representation of a quadrangular building placed with both its sides inclined to the picture, and covered with a common A. roof, is required.

Let the figure G. represent the ground-plan with one of its sides produced to 8, its point of contact with the line P. representing the picture. Let S. be the station, V.V. the two vanishing points, for the side and end of the building. Let ⊙ be the point of sight; 1, 2, 3, 4, 5, 6, 7, the visual rays brought from the different parts of the ground-plan through the picture to the station S. The line *b.* is to represent the centre or ridge of the roof; *a. a.* the thickness of the front wall, and *k. k.* the width of the door.

The elevation of the front is represented by the figure E.; the elevation of the roof (or its perpendicular height) by E. R., and the door by I. The



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elevation of the end of the building is represented by E. E.; the inclination of the roof by *f. d. g.*, and is circumscribed by the ideal lines *f. l.*, *l. m.*, and *m. g.*, for the purpose of finding the perspective apex of the end of the building, and with it the upper ridge of the roof.

When the perpendiculars 1, 2, 3, 4, 5, 6, 7, 8, are placed upon the line B. in the lower figure, mark on the line of contact 8 the point *i.* for the height of the door I.; also the point *h.* for the height of the side of the building E. Mark a point at O, for the height of the roof, E. R. A line is then to be drawn from the bottom of the line of contact 8 to the left-hand vanishing point V., for the ground line of the building, which will be given at the intersections of the perpendiculars 1, 5. Draw another line from *i.* to the same vanishing point for the height of the door, shewn by its passage across the perpendiculars 2, 4. Carry a line also from *h.* to the same vanishing point, for the height of the side of the building, given at *e. f.*, by the intersections of the perpendiculars 1, 5; and a line from O. to the left-hand vanishing point V. for the height of the roof: which would be at *l.* were the centre of the roof advanced to the front of the building; but being removed considerably back, it will be necessary to produce a line from *l.* to

the vanishing point V. on the right, in order to shew its height at the centre of the building, which will be given by intersecting the upright line 6 at *d.*, the line 6 marking the perspective centre of the building.

The inclination of both sides of the roof is obtained by the ideal lines *l. f.*, *l. m.*, and *m. g.*, in figure E. E., being placed in perspective.

It is evident that the ridge of the roof *d. c.* being farther removed from the eye than the lower edge or eaves *f. e.*, must appear shorter; consequently the end lines, *d. f.* and *c. e.*, cannot be parallel, and would necessarily meet if continued sufficiently upwards. Their point of junction would be the vanishing point for the front or visible side of the roof.

This vanishing point is found by erecting a perpendicular line upon the horizon H. from the vanishing point on the right to V. R., the place where the line *f. d.* continued meets the perpendicular produced from the horizon. The farther end of the roof is determined by drawing a line from the angle *e.* to V. R., giving the perspective length of the ridge by intersecting it at *c.* The inclined courses of slates, tiles, &c., on this side of the roof would all tend to the vanishing point V. R., and horizontal divisions to their proper vanishing point on the left.

Lastly, for the thickness of the wall at the door, let the line *k*. be drawn from the angle made by the ground line of the building, at the intersection of the perpendicular 2, to the vanishing point on the right; for the section of the wall at the door being parallel to the end of the building, it will take the same vanishing point.

PLATE IV.

A PERSPECTIVE drawing of a house with a chimney and hipped roof, according to the elevations *fig.* 2. and *fig.* 3, and standing at a given angle with the plane of delineation, is required.

When the elevations, ground-plans, &c., are accurately laid down, as in the former plates, proceed with the perspective drawing, *fig.* 4, after the manner recommended in the foregoing examples, *viz.* by placing the horizontal and base lines H. B., also the perpendiculars 1, 2, 3, 4, &c., having their relative distances to correspond with the distances 1, 2, 3, 4, &c., in the ground-plan, *fig.* 1.

Next take the height of the roof from the ground line in the elevation, *fig.* 2, which place on the line of contact at *e.* From this draw a line to V. 1, cutting the perpendicular 8 (the nearest corner of the building continued upwards): thence carry the line in the direction of the vanishing point V. 2; and

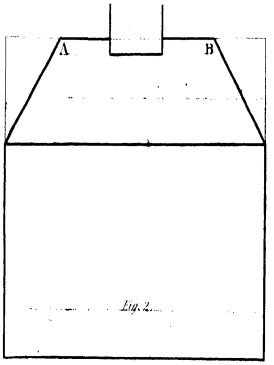
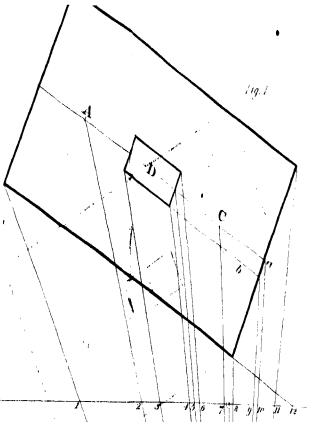


Fig. 2.



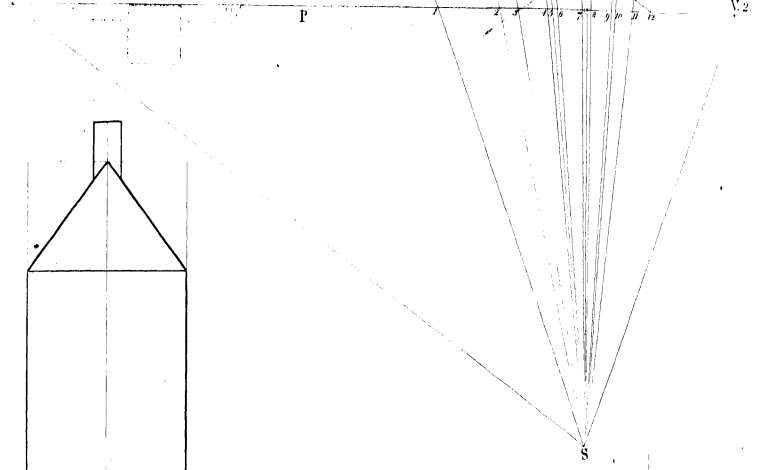


Fig. 3

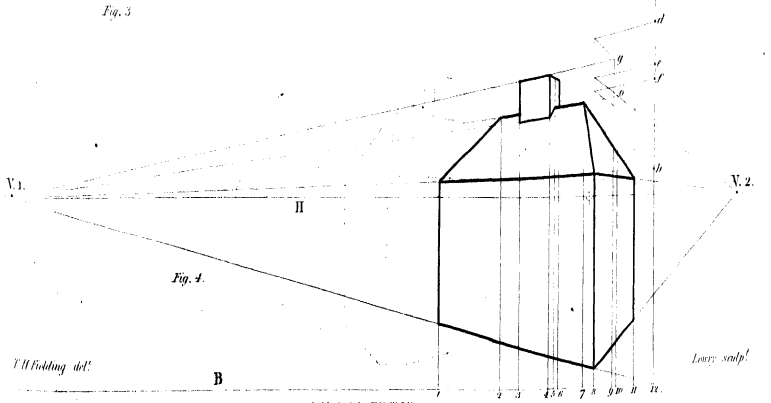


Fig. 4.

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from the intersection of the vertical 10 at the angle *o.*, return the line again to V. 1, marking between the verticals, 2, 7, the extent of the roof, representing the space between A. B. in *fig.* 2. On the line of contact, *h.* denotes the lower edge or eaves of the roof, which are obtained as in the last plate.

For the hipped ends of the roof, carry lines from the angles made by the ridge line on the verticals 2, 7, slanting downwards to the three corners at the lower edges of the roof, where the perpendiculars 1, 8, 11, are intersected.

For the chimney, take the height from the dotted line of the roof which runs through the elevation of the chimney in *fig.* 2. Place it upon the line of contact from *e.* to *d.*, and proceed as was done for obtaining the top or ridge of the roof, *viz.*, by carrying a line towards V. 1, and from the angle at its junction with the perpendicular 8, draw the line towards V. 2, in order to bring the height at *g.* upon the perpendicular 9, which represents the place where the nearest corner of the chimney would appear upon the transparent medium, or plane of delineation, to a spectator standing at the station S, previously supposing this corner of the chimney brought to the end of the building, as laid down by the line *b.* in the ground-plan, *fig.* 1, and shewn on the picture by the transit of the visual

ray 9. From *g.* return the line to V. 1, which will mark the height of the chimney upon the verticals 3, 4. Then from the nearest corner of the chimney which is upon the vertical 4, draw a short dark line in the direction of V. 2, for its nearer end. The depth of the chimney within the roof is marked upon the line of contact at *f.*, and carried forwards exactly in the same mode as for the upper part.

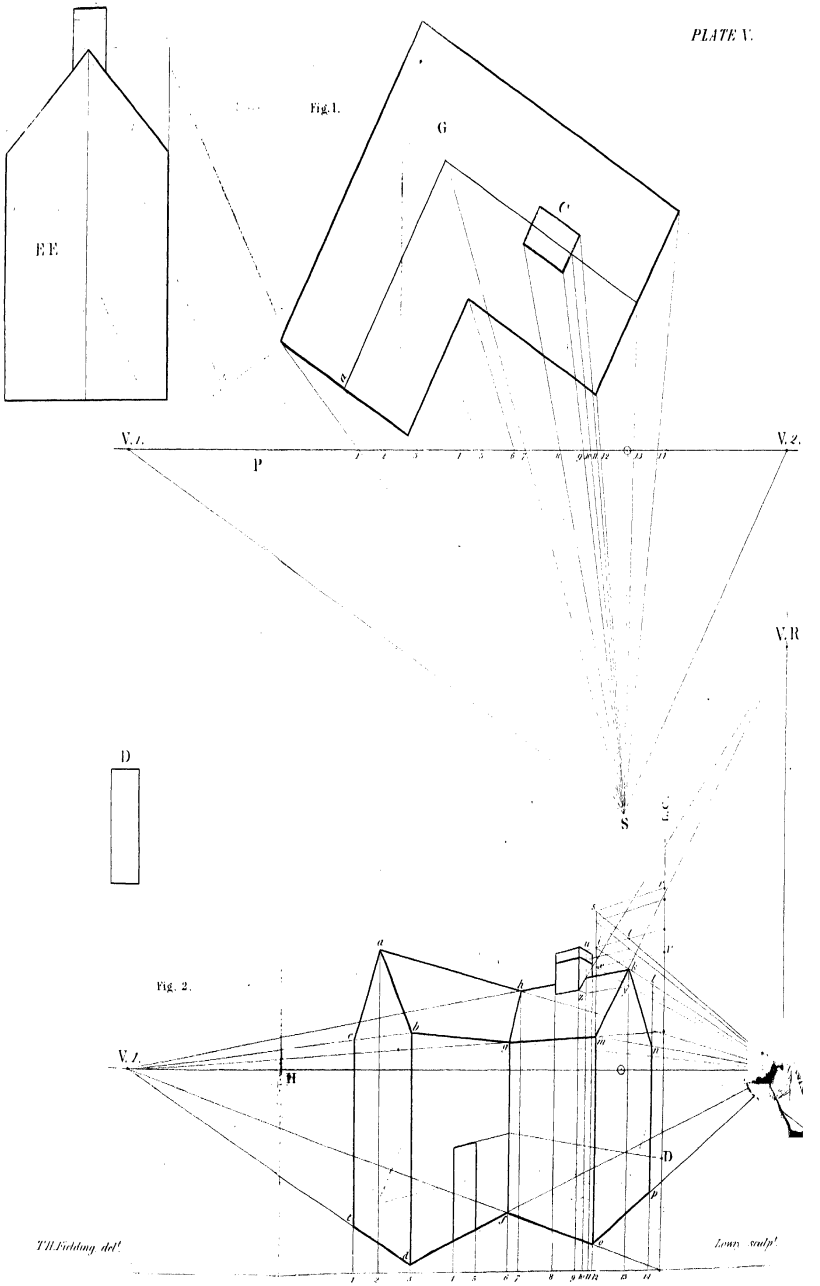

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PLATE V.

LET *fig.* 1, Plate V., be the ground-plan of two buildings standing at right angles with each other, all their sides making angles with the picture; a chimney on the roof to the right, and a door in the building on the left, as marked on the ground-plan. Let *fig.* E. E. be the end of the part that has the chimney, and *fig.* D. the elevation of the door: let P. be the picture, and S. the station from which the whole is seen.

To obtain a perspective drawing according to the above plans and elevations, proceed as follows:—

Presuming that the student has read the descriptions of the preceding plates, no more of the process need here be explained than that which has not before occurred. When the height of the roof is laid down, *fig.* 2, upon the line of contact, as at *v.*, and transferred to the perpendicular 12, and again from that to the centre line of the gable end 13, from the

point *k.* (the summit of the gable end), draw a line to the vanishing point V. 1; and where it intersects the perpendicular 7 will be found the angle made by the upper junction of the two roofs at *h.*, from which carry a line to the left with the ruler placed upon V. 2 and *h.* for the top of the left-hand roof. Its length is determined at *a.* by passing through the perpendicular 2. The lower line of the roof is to be drawn in the same manner from the line of contact, and will intersect the vertical line 6 at *g.*, from whence a line drawn to *h.* will mark the junction of the two roofs. The lower edge of the left-hand roof is gained by taking a line from its proper vanishing point, V. 2, through *g.* to *b.*, and thence to V. 1, for the eaves of the farther side of the roof. Next place the lines *c. a. b.* to complete this gable end.

In the process adopted for obtaining the height of the chimney there is a small difference between this and the last plate. In this example we take the heights from the line of contact to the continuation upwards of the nearest corner of the house 12, and from thence to the centre line of the gable end 13; and again, from this to the centre line of the chimney. For example, the top line of the chimney is marked *r.* on the line of contact, it is first carried to *s.*, thence to *t.*, and lastly to *u.*, upon which

junction a short dark line is drawn right and left for that side of the chimney. It perhaps need not be added, that this line must correspond with its own vanishing point, V. 2. The height of the door, *fig.* D., is placed upon the line of contact at D., and carried to the junction of the two buildings at the perpendicular 6, by a line from the vanishing point V. 1; then by a line drawn from the vanishing point V. 2, through the angle made at the junction, and continued over the vertical lines 4, 5, the required height will be given.

The process for placing the chimneys in this and the preceding example will suit for objects that are placed upon others, as towers, turrets, &c.; and when their faces or sides are not parallel to the sides of the object upon which they stand, vanishing points must be laid down for them, as directed in the Definitions. (Vide article *Vanishing Points.*)

PLATE VI.

It is required to find the perspective representation of the interior of a room, having its sides placed at right angles with the plane of delineation and the two ends parallel with the same plane.

Let S. *fig.* 1, be the station at one end of the room Z. Z. Let P. P. determine the distance of the picture, intersecting the cone of visual rays *a. b. c. d. e. f. g. h. i. k. l. m. n. o. p. q. r.* at something more than one-third of the length of the room from the station. The necessity of this will be very apparent, when it is considered that it is quite impossible to stand in a room and draw the sides of it up to the end at which the spectator may be placed without moving the head half round on each side; and also, as no drawing of interiors can be made with any truth when the artist is obliged to turn his head to the right or left to see his subject, it is better that no more should be introduced than the eye can con-

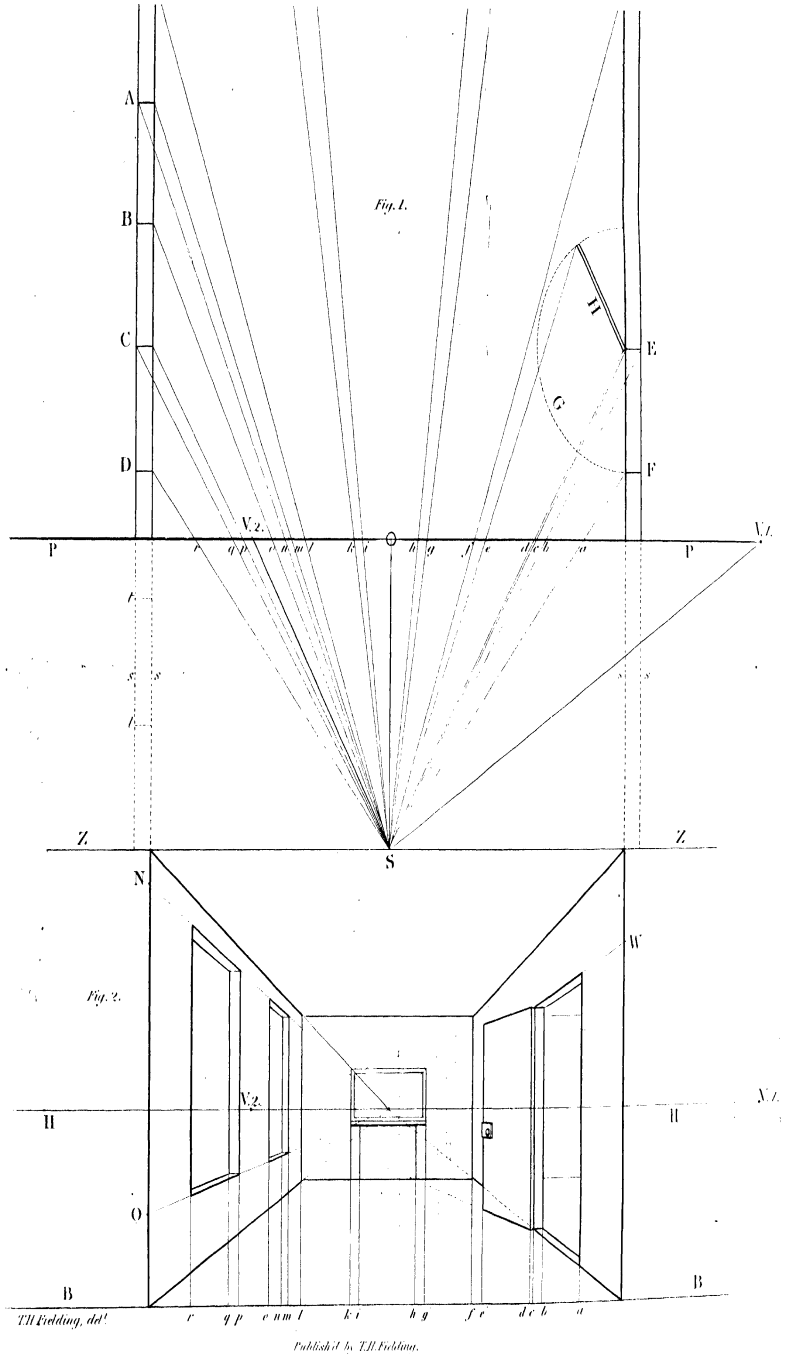
Fig. 1.
A
B
C
D
E
F
G
H
V.2.
V.1.
P
P
Z
Z
S
N
W
Fig. 2.
V.2.
V.1.
H
H
O
B
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veniently take in at a single view. Let the double lines on each side of the ground-plan, *fig.* 1, represent the thickness of the walls. Let A. B. and C. D. shew the width of the two windows that appear in the drawing, *fig.* 2. The short lines at A. B. C. D., parallel with the picture, mark the depth of the embrasures or thickness of the wall. Let K. I. be the width of the fire-place, and M. K.—I. L. the breadth of the marble on its sides. E. F. shall represent the width of the door-way; H. the door opened to a certain angle; and the semicircular dotted line G. the sweep that the door will describe in opening or shutting, by the aid of which the width of the door may be correctly laid down at any given angle. V. 2 gives the place of the vanishing point for the top and bottom of the door: V. 1 is the vanishing point for the edge or thickness of the door. As this line is so short that we cannot easily obtain a true parallel to it from the station for its vanishing point, it will be more correctly performed by first placing the vanishing point V. 2, and then by carrying from the station a line at a right angle with the line that marks the position of V. 2. The position of V. 1, will be obtained if we suppose the edge of the door to make a right angle with its side. Let ⊙ be the point of sight and centre of the picture; being the

vanishing point for all the lines that are perpendicular to the picture, it will serve for the upper and lower lines of the room, windows, and door-way. The depth of the wall in the door-way is shewn by short lines at E. F. The double dotted lines, *s. s. s. s.* on the right and left, standing between the lines P. P. and Z. Z., are merely to complete the size of the room. The short dotted lines *t. t.* shew where the third window is placed; but as this portion of the room is not introduced in the perspective, *fig.* 2, no further reference to it will be required.

For the perspective drawing, *fig.* 2, we commence by drawing the lines H. H. and B. B. for the horizontal and base lines, with the perpendiculars *a. b. c. d. e. f.*, &c. placed upon the base line, at distances equal to the distances on the line P. P., *fig.* 1, made by the visual rays upon the picture in their passage from the station to the various points on the ground-plan. Place upon the horizontal line H. H. *fig.* 2, the points V. 2, ⊙ and V. 1, also at their proper distances, according with the ground-plan, for vanishing points. In this example, the sides of the room coming close up to the picture, will serve all the purposes of a line of contact on either or both sides of the drawing, being in contact with the picture. Thus the points N. O. *fig.* 2, being assumed

as the length of the windows, may be laid down on the line which is produced by a continuation of the inner dotted line S. *fig.* 1, to the base line B. B. *fig.* 2, for the termination of the room on that side: then by drawing lines from the points N. O. to the centre of the picture ⊙, the upper and lower lines of the windows will be determined; also by drawing lines from the angles made by the junction of the two outer perpendicular lines of the room and Z. Z. to the centre of the picture or point of sight ⊙, we shall obtain the upper and lower lines of the room where it divides from the ceiling and floor. The two further corners of the room are marked by the intersections of the vertical lines *l. f.*

It is to be noticed, that all original lines which are parallel with the picture take no vanishing point, but are to be laid down in the perspective drawing parallel to the horizontal and base lines: accordingly the lines of the ceiling at the farther end of the room, the thickness of the walls in the soffits, and sills of the door and windows, are all to be made parallel with the horizon and base lines. Thus to obtain the breadth of the soffit in the first window, draw a line from the intersection of the perpendicular *p.* by the line N. ⊙, parallel to the horizontal line until it cuts the perpendicular *q.*, producing the required breadth

of the ceiling of the window, more properly called the soffit.

The same process serves for the remaining window and door.

For the height of the door-way carry a line from the point W. (its assumed height) to the point of sight ⊙. From V. 1, draw a line through the angles made by the line W. in its passage over the perpendiculars *c.*, the line upon which the door is supposed to hinge: continue the line to the perpendicular *d.*, thus attaining the thickness of the door at the top. The same process will mark its thickness at bottom. From the upper and lower intersections of the perpendicular *d.* draw lines to the vanishing point V. 2, which in their transit across the vertical line *e.* will shew the height of the farther edge of the door. The lock on the door, and the frame over the fire-place, are introduced for the sake of finish and without data. For the fire-place nothing more than the perpendiculars are given, as *k. i. h. g.*, *fig.* 2: the height would be found in the usual way. The lines seen through the door, mark the floor and ceiling of an adjoining room, and are produced by continuing the floor and ceiling of the room that we have just completed.

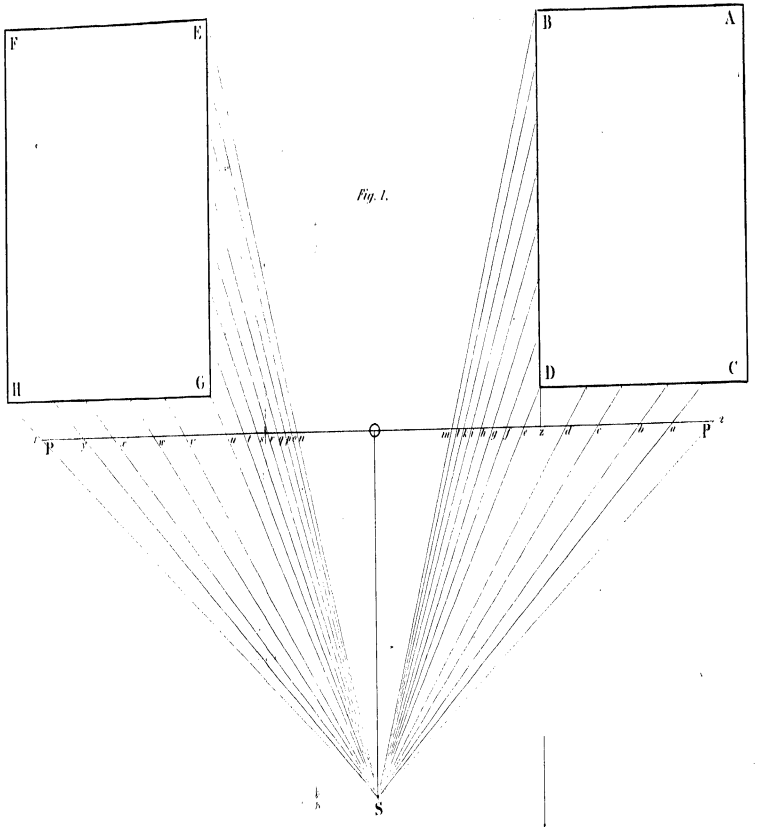

Fig. 1.

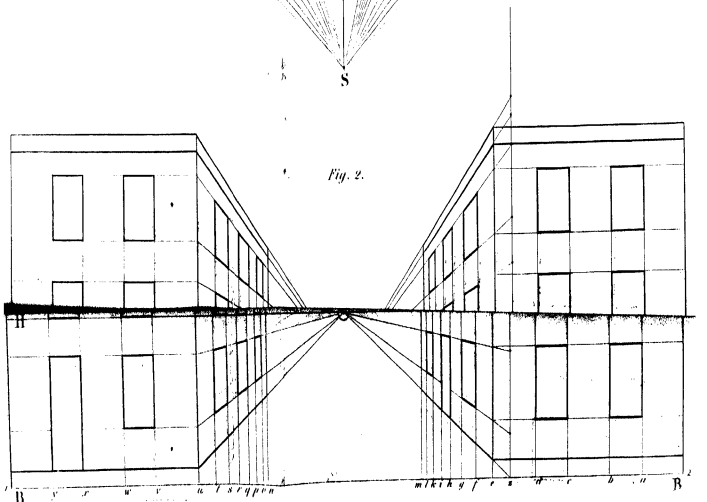

Fig. 2.

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PLATE VII.

THIS is an easy exercise on the last plate, and represents a portion of a street, where the spectator is supposed to stand opposite to its centre, of course seeing an equal quantity of building on both sides.

The point of sight is the only vanishing point requisite in this diagram. The lines on the ends of the buildings being parallel to the picture, require none, and are all to be made parallel to the horizontal line. The depths of the windows and doors, and also the thickness of the walls, have been omitted throughout for the sake of perspicuity, the preceding plate having sufficiently explained the mode of introducing them.

PLATE VIII.

THE perspective appearance of a bridge is required, composed of one arch, and placed at a given angle with the picture.

Fig. 1 shall represent the ground-plan, the line C. marking the position of the centre of the arch. The lines A. B. shall shew the span of the arch, and also the width of the piers. Let visual rays be carried from all the angles to the station S. We are not unfrequently, in perspective diagrams, obliged to imagine the object transparent (as in this), for finding the situation of fronts by their agreement with the farther or hidden sides of the object. Here we have to draw the visual ray 4, *fig.* 1, through the body of the pier, as the angle from which it is taken could not be seen from the station at S. Let *fig.* 2 represent the elevation or plain front view: the parallel lines H. I., M. N., D. E., the perpendicular C. O., and the diagonals G. O., F. O., be placed to

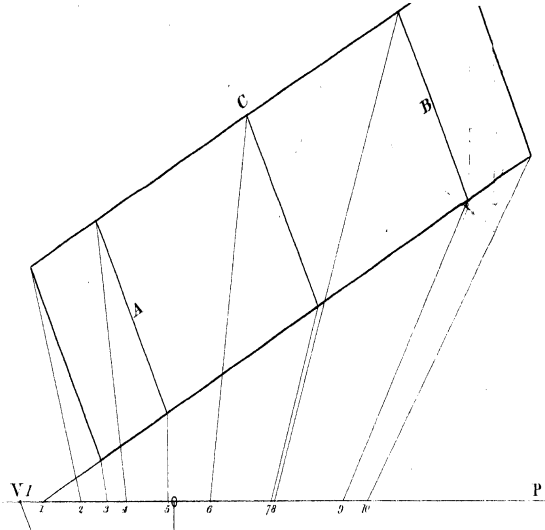

Fig 1

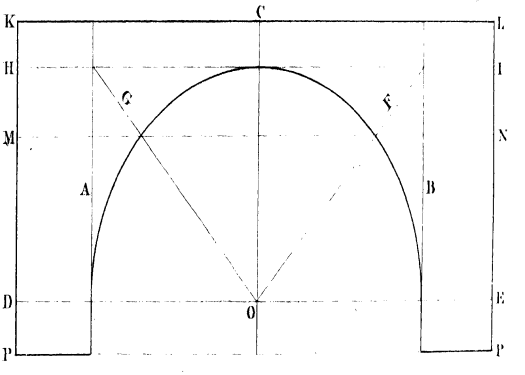

Fig 2.

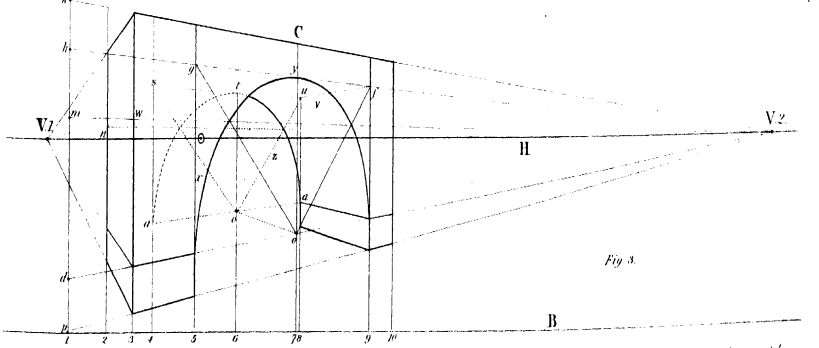

Fig 3.

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assist in finding certain points, by their intersections of the different perpendiculars and each other. It is through those intersections, when produced in the perspective *fig.* 3, that the ellipsis representing the arch of the bridge is to be drawn by hand, or by finding the centres of the ellipsis after the leading points are laid down, as circles or segments of a circle, become elliptic when seen in angular perspective; that is to say, upon a surface that makes any visible angle with the picture. Let the lines K. P. P. L., *fig.* 2, mark the base, summit, and ends of the bridge; D. E., the line from which the arch springs; O. the centre; and A. B. its extreme width, as measured from the ground-plan A. B., *fig.* 1. A point on each shoulder of the arch is found by the diagonals G. and F. intersecting the line M. N. The centre of the key-stone of the arch is marked by the perpendicular C. intersecting the line H. I. The arch is next to be described upon these points from the centre O. and bounded by the perpendiculars A. B.

When the horizontal and base lines are drawn in *fig.* 3, H. B., set off the perpendiculars 1, 2, 3, 4, &c., *fig.* 3, at proper distances from each other, agreeing with the same in *fig.* 1, also the vanishing points V. 1, V. 2, and point of sight ⊙: then upon the line

of contact 1. place the points *k. h. m. d. p.* equal to the heights K. H. M. D. P., *fig.* 2. From those points draw lines to V. 2, and from the upper and lower intersections of the perpendicular 3, carry lines to V. 1, by which we get the general contour of the bridge. The intersection of C. 7, by a line from *d.* to V. 2, will mark the perspective centre of the arch at *o.*: also the crown of the arch at *y.* will be given by the passage of a line from *h.* across the same perpendicular. The diagonals *g. f.*, by cutting the line *m.* from the centre, will give the places for the shoulders of the arch. We have now obtained five points, namely, the two points from whence the arch springs, given by the line *d.* V. 2, at its passage through the verticals 5 and 9, the two shoulders, and the crown.

The ellipsis is now to be drawn through these points with a steady hand: afterwards we proceed to discover the situation of the farther side of the arch. First draw the dotted line *o. o.* from the vertical 7 to the vertical 6, in the direction of the vanishing point V. 1. This gives the back centre of the arch. From the angle at the junction of the diagonal *f.* with the vertical 9, draw a dotted line towards V. 1, stopping at the angle *u.* on the perpendicular 8. We shall then gain the top of the

back arch by laying the ruler from V. 2 to *u.*, and thence carrying a dotted line to *s.*, where it touches the upright line 4, passing through the upright line 6 at *t.*, the crown of the farther arch. The dotted diagonals *s. o.* and *u. o.* are to be drawn: after this, a line from the point *w.*, made by the line *m.* upon the vertical 3, in the direction of V. 1, thus giving at *n.*, on the perpendicular 2, a point from whence a dotted line drawn to V. 2, will mark the shoulders of the farther arch, by crossing the dotted diagonals *s. o.* and *u. o.* The dotted line *a. a.* is to be produced by carrying a line through the farther centre *o.* to V. 2, marking upon the perpendiculars 4, 8, the points from which the back arch is to spring. The dotted part of the ellipse is that portion of the perspective arch which would be invisible.

PLATE IX.

It is required to place in perspective an arcade of three arches standing on a plane parallel to the picture or plane of delineation, the point S., *fig.* 1, being the station from which the arcade is to be viewed.

Note. Arches situated on a plane parallel to the picture will not vary in size, but be equal to each other along the front, and also the back part of the arches will be equal to each other, assuming that they are arches of equal magnitudes in the originals. Thus the apparent size of any one of them at the front will determine the front of all the rest, and the apparent size of the back of any one of them will give the size for the back part of the remaining arches.

The ground-plan being accurately laid down as in *fig.* 1, we proceed in the usual mode, working only for the centre arch, the others being worked

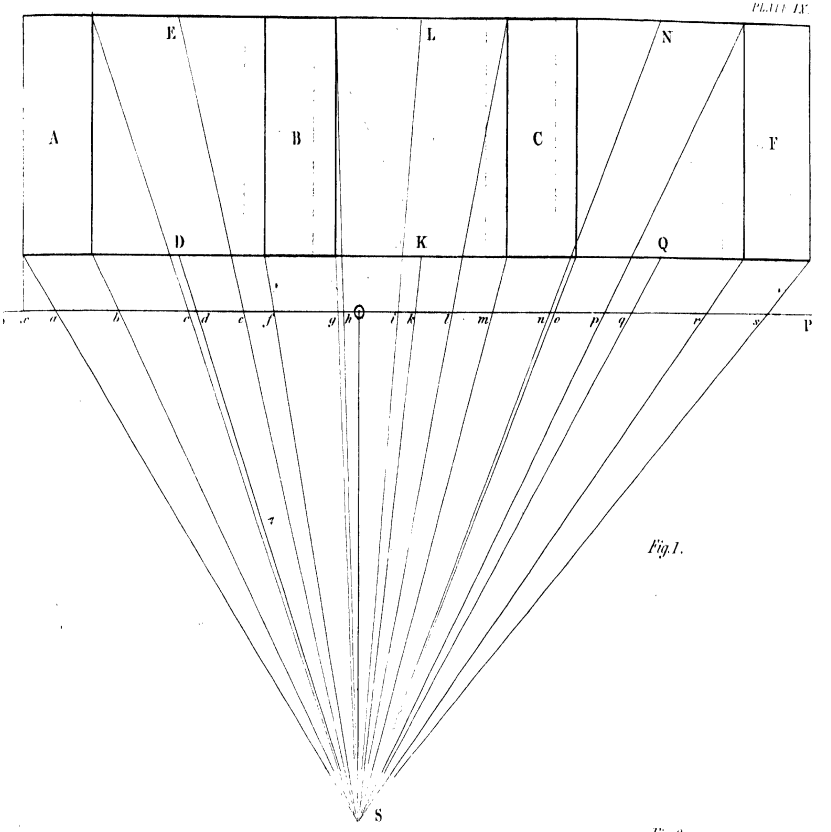
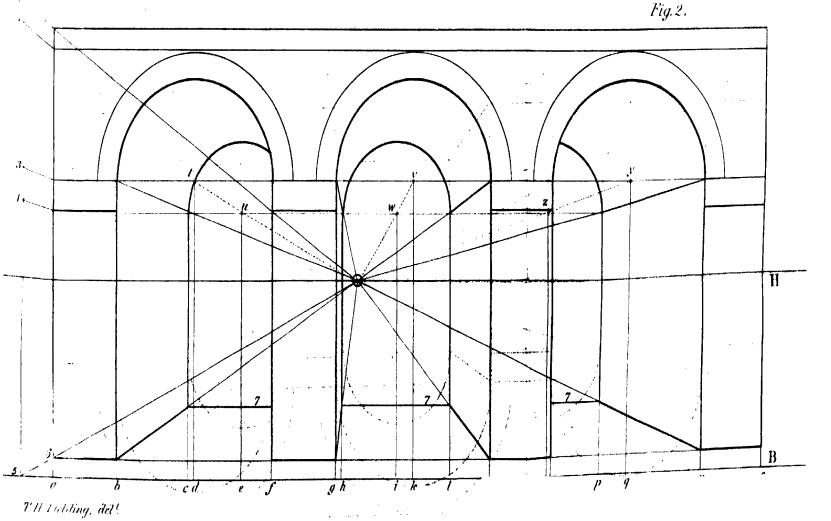


Fig. 1.

Fig. 2.



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in the same manner. Let ⊙, *fig.* 2, be the point of sight placed upon the horizontal line H. Let *g. h.* be the perpendiculars for the depth of the pier on the left; *l. m.* for the depth of the pier on the right; *i. k.* for the situation of the centres of the front and back arches; and the perpendicular x. the line of contact. Let the dot 1. on the line of contact, be assumed as the whole height of the arcade, from which a line is to be drawn to the point of sight (vide DEFINITIONS, *point of sight*); at the intersection of the perpendicular *a.* is obtained the perspective height of the front of the arcade, from which a line is to be carried parallel with the horizontal line H. till it meets the perpendicular *s.* At 2. on the line of contact, we suppose the depth of the band, coping, or parapet of the wall, which is produced on the arcade in the same manner. From 3. on the line of contact, we obtain by the same mode the heights of the piers on which the arches are turned: 4. marks the depth of the capitals of the piers; and 5. is to give the perspective distance into the picture of the base of the arcade, shewn at the angle 6. Next is to be placed one point of the compasses at *v.*, the front centre of the middle arch, which is given by the passage of the parallel line obtained from 3. across the perpendicular *k.* at *v.*: the arch is then to

be turned from the intersections made by the same parallel 3, at the perpendiculars *g. m.*

From the centre of the front of the arch draw the dotted line *v.* to the point of sight: at its transit over the perpendicular *i.* the point *w.* will be marked, from which describe a smaller circle to meet the perpendiculars *h. l.*, as was done for the front. Although a line drawn through the point *w.* to the right and left, and parallel with the horizon, would, by intersecting the perpendiculars *e.* and *n.*, be sufficient to produce the back centre of their respective arches, it has been considered useful to lay down also the manner used in the centre arch, by carrying dotted lines from the fronts, as at *t. y.*, to the points *u. z.*; thus giving to the student a satisfactory proof of the correctness of both modes, by their uniting so exactly in the same result.

The depth of the piers at their bases, is shewn by lines drawn from the angles made at the base of the arcade, by the line 6. passing (parallel to the base of the picture) through all their front perpendiculars, and are to be drawn severally to the point of sight ⊙, giving at the intersections of the vertical lines *c. h. l. p.* the depth of the sides of the piers. The lines 7. 7. 7. finish the base of the arcade at the back.

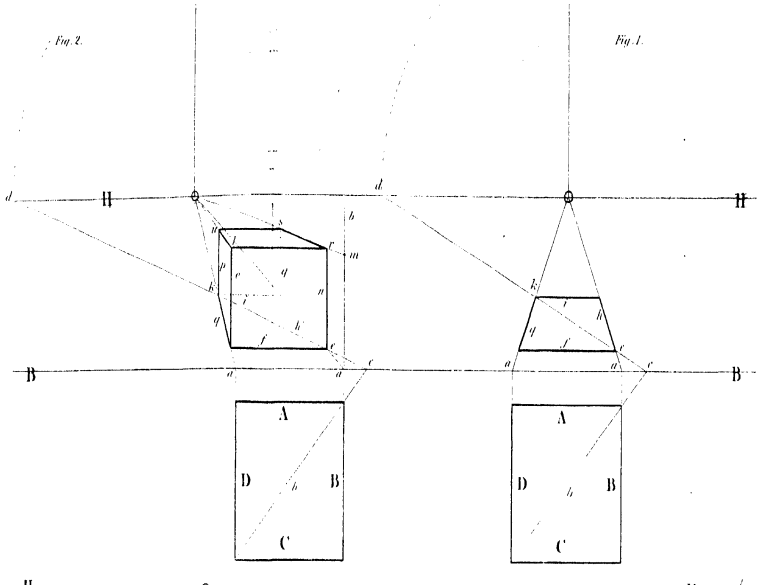
Fig. 2.
Fig. 1.
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B
C

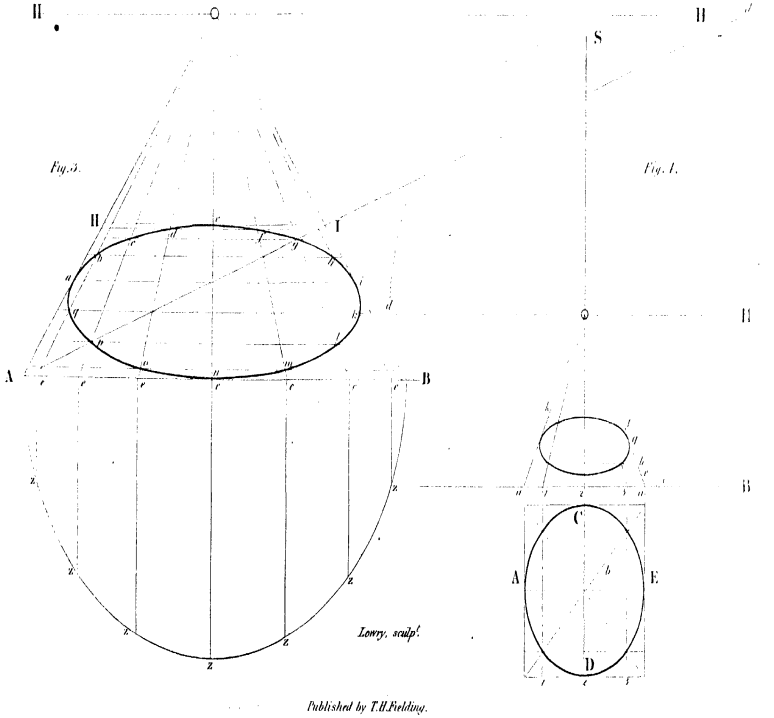
Fig. 3.
Fig. 4.
H
S
A
B
C
D
E
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PLATE X.

THE perspective area of a square space on the ground at a given distance from the plane of delineation is required, the front of the area being parallel to the picture.

This diagram, as well as figure 2, are constructed upon the principles laid down in the Jesuit's Perspective, and are taken from an anonymous author.

The four lines A. B. C. D., *fig.* 1, are to be laid down as the boundaries of the required area, and placed at a given distance below the base line of the picture B., which is to represent the actual distance of the area from the picture.

Let the sides D. B. be continued upwards to the base of the picture at *a. a.*, from whence two lines carried to the point of sight ⊙ on the horizontal line H. will give the two lateral boundaries of the perspective drawing. The line S. ⊙ represents the distance of the spectator from the picture, which

carried down to the horizon at *d.* places what is called the point of distance, to which all lines that make an angle of 45° with the ground-line may be drawn; a discovery, perhaps, first published to the world by Serlio, in 1540.

Produce the diagonal *b.* in the ground-plan A. B. C. D. and continue it to the base line of the picture B. at *c.* From *c.* draw a line to the point of distance *d.*, which will cut the two side lines of the perspective area *g. h.* at *e.* and *k.*; from which points lay down the lines *i. f.* parallel to the base and horizontal lines, and the required perspective *i. q. f. h.* will be completed.

Figure 2. is the representation of a solid in perspective, two of whose sides are parallel to the picture, and is also constructed on the principles used in the Jesuit's Perspective.

When the ground-plan is drawn as in *fig.* 1, and the perspective base of the solid *q. i. f. h.* as in the same figure, draw the line of contact *b.* by a continuation of the side B., or at the point *a.*, where the side B. of the ground-plan is made to come in contact with the base of the picture, erect the perpendicular *b.* for the line of contact. Place the four perpendiculars, *p. o. q. n.* of any sufficient length, upon the angles at the base of the solid. Let the point *m.* on

the line of contact, be assumed as the height of the solid, from which a line is to be drawn to the vanishing point ⊙ (point of sight), which will intersect the perpendiculars *n. q.* at *r. s.*: then from the angles *r.* and *s.* draw two lines parallel to the base, and horizontal lines B. and H. which will cut the opposite perpendiculars at *u. l.* From *l.* carry another line to the vanishing point ⊙, which will finish the required figure.

Figure 3. shews the perspective appearance of a circle at a given distance below the horizontal line. This diagram is ascribed to the invention of Serlio, and is also taken from the Jesuit's Perspective.

If the circle be large, take the following method, which Serlio has directed. Set one foot of your compasses in the middle of the fundamental line, with the other describe the semicircle A. *z.* B.: divide its periphery, or circumference, into any number of equal parts at pleasure. You will see in the process, that the more of these divisions, the easier it will be to form the circular lines from the junction of which the circle receives its appearance. The semicircle A. *z.* B. is here divided into eight parts, which is the usual practice. From the several divisions, *z. z. z.*, &c., perpendiculars are raised to the

base line, in the points *e. e. e.*, &c.: this done, the diagonal is to be drawn to the point of distance upon the horizon. Thus you get the square, A. H. I. B. Draw lines or rays from all the points, *e. e. e.*, &c., towards the point of sight, and through the intersections of those lines with the diagonal draw parallels. Then beginning in the middle of one of the sides of the square to make a point, as *a.*, connect it by a circular line with the opposite angle *b.*: and proceeding thus with arches from angle to angle, according to the direction of diagonals through the points *a. b. c. d. e. f. g. h. i. j. k. l. m. n. o. p. q.*, you will have the whole circle in perspective.

For a pavement, tessellated or plain, the mode pursued in this diagram would be sufficient, with no other difference but that of marking the divisions *e. e. e.*, &c. at equal distances upon the base line.

Figure 4. is another plan for performing the same operation, which will readily be understood after the student has worked the three preceding figures. The only remarkable difference is in the construction of the ground-plan, which gives the perspective circle by producing eight points through which the ellipsis is carried, instead of sixteen, as in *fig.* 3.

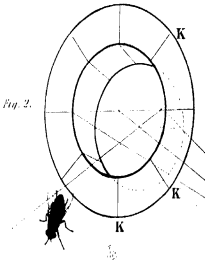

Fig. 2.

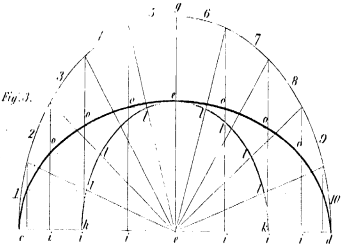

Fig. 3.

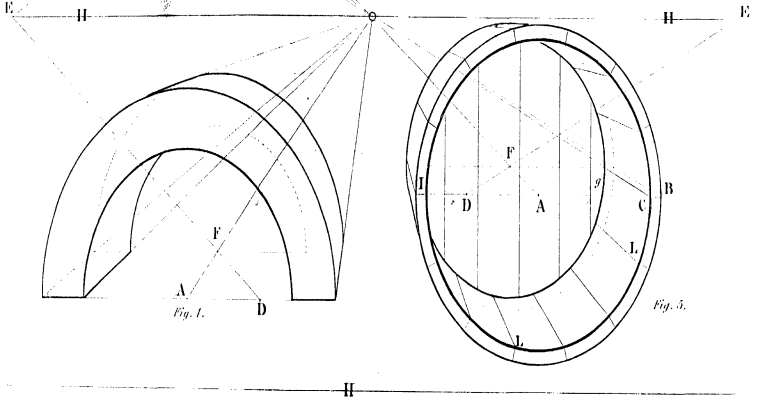

Fig. 1.

Fig. 5.

Fig. 1.

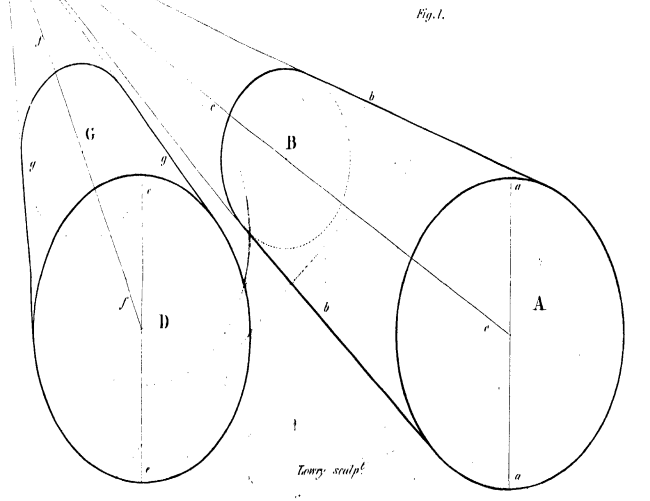

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PLATE XI.

FIGURE 5. represents a shallow tub put with its front or mouth parallel to the picture. This figure and also figures 2, 3, and 4, are borrowed from the Jesuit's Perspective, an excellent work at the time it was published, and still abounding with much useful information collected from the different ancient writers upon the subject.

Having described a whole circle, B. L. I., from the centre A., from the same centre, and from the extreme of the diameter B., draw lines to the point of sight ⊙; then setting the breadth or depth of the tub required, on the line B. I. as here D. A., from the point D. draw a line to the point of distance E., and through F., the point where D. E. and A. ⊙ intersect, draw a line parallel to the base till it cuts the ray B. ⊙ in the point *g*. This done, setting one leg of your compasses in F., and in the other taking the distance *g*., describe as much of a circle as the outer

edge of the tub will permit, and which will be its depth. All the lines L. L. are to be drawn to the point of sight ⊙, and the short lines on the edge of the tub, also belonging to the division of its staves, must be carried to the centre A. The same process will serve for circular and semicircular windows when parallel with the plane of delineation, as is shewn in the figures 2. and 4.

The method of putting elliptical or flat arches into perspective is the same with the semicircular, when also parallel with the plane of delineation. The principal difficulty is in finding the outline, and for which the following mode (amongst others) may be used.

Suppose the line *c. d.*, *fig.* 3, given, upon which a flat arch is to be raised of the height *e. e.* From the centre *e.* describe a semicircle, *c. g. d.*, and divide it into any number of equal parts at pleasure, as is here done into ten, and from all these divisions draw lines to the centre *e.*; then again from all these divisions draw perpendiculars to the diameter or chord *c. d.*, as are the lines *o. i.*, *o. i.*, &c. This done, describe a semicircle of the given height of the arch, as *h. e. k.*, and through the intersections made by this lesser circle on the division lines of the greater, draw short parallels to meet the perpendiculars which fall from the same divisions (for instance, *l. o.*, *l. o.*, *l. o.*,

&c.), and the several points *o.*, connected together as is here done, will give you the arch required. It will readily be perceived that the arch may be made more or less flat by decreasing or increasing the inner circle. This figure and description are taken from Serlio.

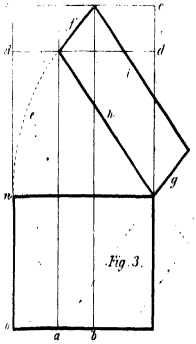
Figure 1. represents the manner in which two columns lying on the ground parallel to each other, and having both their ends parallel to the picture, of course the direction of their axis will be towards the point of sight, their proper vanishing point. This figure is so simple that it requires no other explanation.—*From an anonymous author.*

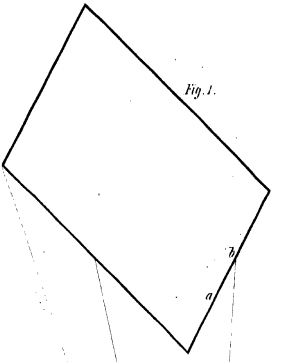
PLATE XII.

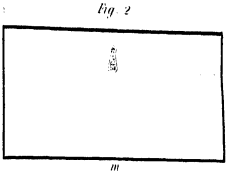
REQUIRED, the perspective drawing of a box with the lid open, at a given angle, the end and front of the box being placed at certain angles with the picture, according to the ground-plan, *fig.* 1.

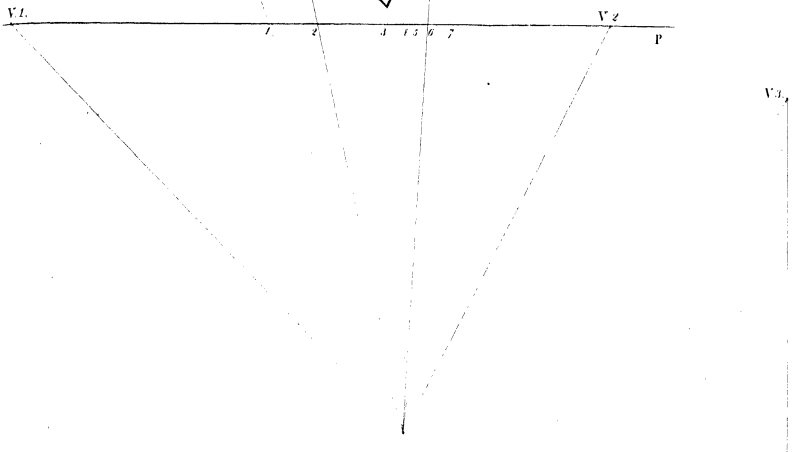
Let figure 2. represent the front of the box without the lid; *k. i.* the depth of the key-hole; and *m.* the centre upon which it is placed. Let *fig.* 3 give the elevation of the end of the box, with its lid opened at the angle given, and the various lines requisite for finding the two upper angles of the lid.

Note. The simplest manner of finding the inclination of planes, or of placing cones, pyramids, prisms, &c., whether upright or inclined, in perspective, is to inscribe the figure within a right-angled solid or plane, of which the different lines or faces of the figure may be supposed so many sections; and as a right-angled solid or superficies is very readily placed in perspective, any form inscribed within such figures









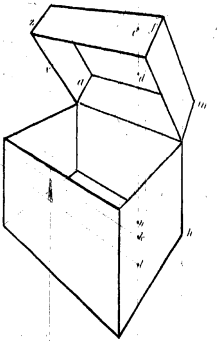


Fig. 1.

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B

1 2 3 4 5 6 7

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will necessarily be correct, if a sufficient number of leading points are laid down in the plan and elevations. In this elevation (*fig.* 3.) we suppose the principal portion of the lid to be placed upon a plane equal to the width of the end, and also equal to the highest point of the lid. This plane is intersected by the lines *d. d.*, *a. b.*, the arc *e.*, the diagonal *f.* (its opposite *g.* is without the plane), and the lines *h. i.*, parts of the lid. The lines *a. b.* are to be placed in their relative positions on the end of the ground-plan, and produce the visual rays 5, 6.

Let *fig.* 4. be the perspective drawing, with the vanishing points V 1. V 2, and the perpendiculars 1, 2, 3, 4, 5, 6, 7, transferred from the ground-plan *fig.* 1. When these are rightly placed upon the base line, mark the various heights on the line of contact, as *l. k.* for the key-hole, *n.* for the height of the box, *d. e.* for the points given by the two upper angles of the lid in *fig.* 3. Let the perpendiculars 3 be continued above the box, to represent the line *c. d. o.*, *fig.* 3.

As Plates I. and II. sufficiently explain the work used for obtaining the perspective of the box, we shall proceed only with the lid.

When the points *d.* and *c.* have been carried to the perpendicular 3 by lines to V. 1, let other lines

be drawn from the points so produced in the direction of V. 2. These will give the small square in perspective, of which *f.* is the diagonal. Let *f.* be continued upwards in the same direction, where it will fall upon a vanishing line which is perpendicular to the horizon, and drawn through the vanishing point V. 2. We thus gain the vanishing point at V. 3. for the shorter lines of the two ends of the lid, the nearer end of which is to be perfected by taking a line from the lower angle of the same perspective square of which the diagonal is *f.* through that corner of the box where the lid is joined, and to be continued downwards until it meets the perpendicular vanishing line that is brought from V. 2. The point of junction will be another vanishing point for the longer lines of both the ends of the lid. From this same vanishing point draw another line to the upper point of the diagonal *f.*: there will then only be wanting a line from the angle at the junction of the box and its lid, to be carried to V. 3, which will finish this end by the intersection at *m.* From the angle *m.* make a line to V. 1, also the line *a.* to V. 3, for the farther or internal corner. Next place the line *r.*, which is to be drawn from the vanishing point below the base line through the farther junction of the box and lid, and continued till it intersects another line

drawn from the lower point of the diagonal *f.* to V. 1, making the angle *z*. From this angle produce another line to V. 3, thus intersecting a line that has been brought from the upper point of the diagonal *f.* This completes the lid. The thickness of the material which might compose its sides would be drawn according to Plate II.

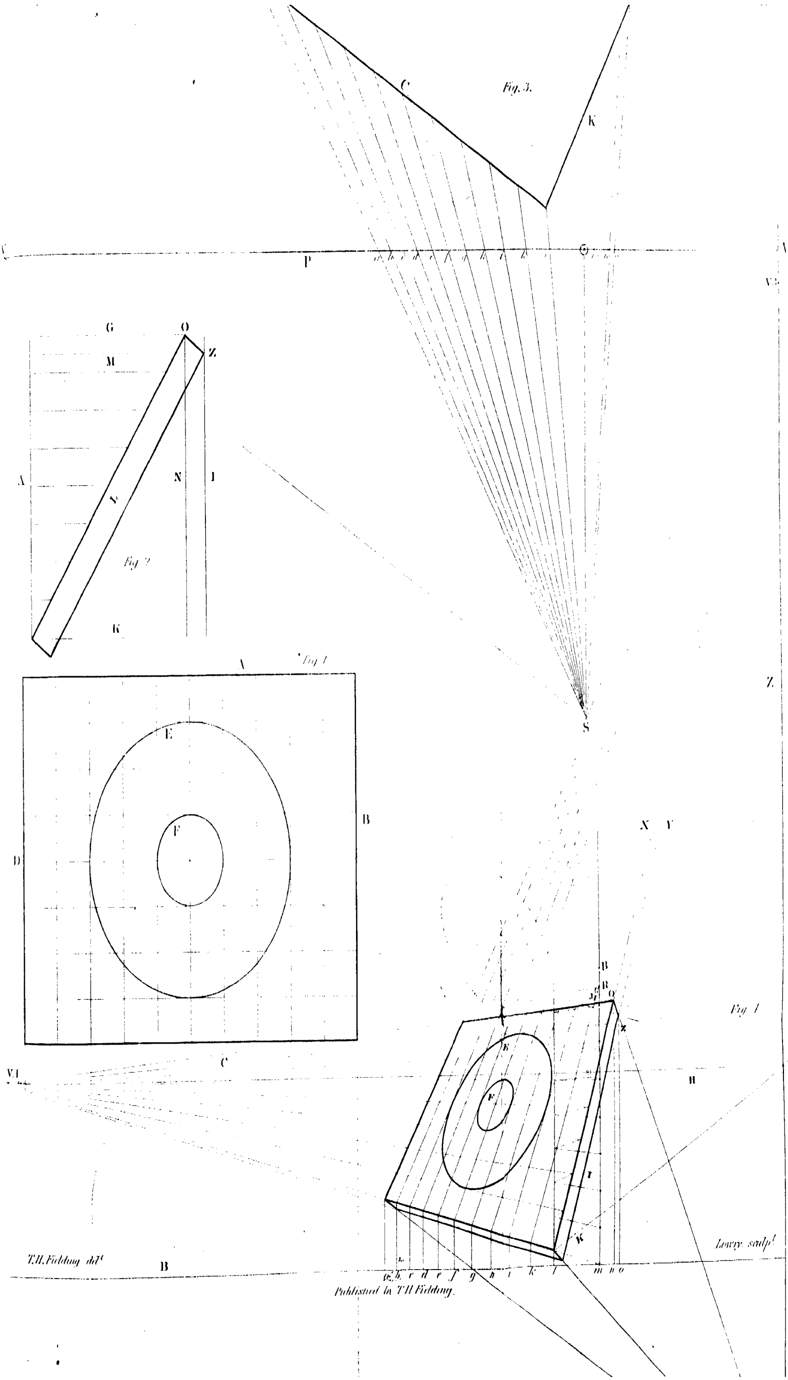
PLATE XIII.

THE perspective representation of a target is required, of two circles upon a quadrangular board inclined to the horizon at a given angle, and also standing obliquely to the picture.

Let A. B. C. D., *fig.* 1, represent the board upon which the circles E. and F. are inscribed, and let this board be divided into a stated number of squares.

Let the inclined parallelogram L., *fig.* 2, represent the thickness of the board and its degree of inclination. Let the two longest sides of the parallelogram be placed within two other parallelograms, of such size that they may circumscribe the two sides of parallelogram L. so exactly, that they shall become the diagonals of the ideal parallelograms G. O. N. K. A., and M. Z. I. K. A.

Let C. *fig.* 3, be the ground-line of the board placed at an angle it makes with the picture P., and



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continued to *m.* for the point of contact. Let K. be the ground-line of the two ideal parallelograms K., *fig.* 2. Upon the ground-plane of the target C. mark a number of points at equal distances, agreeing with the number of squares and their width on the target, *fig.* 1: also at the farthest end of the ground-line K., *fig.* 3, set off the space which originates the rays *n. o.*, equal to the width N. I., *fig.* 2. From all these points, on C. and K., *fig.* 3, draw visual rays to the station S., a line from S. to ⊙ for the point of sight, and also the two vanishing points, V. V. on the right and left, for the sides C. K.

When the horizontal and base line, *fig.* 4, and the perpendiculars *a. b. c. d. e. f. g. h. i. k. l. m. n. o.* are correctly arranged, draw from the foot of the line of contact to V. 1. the ground-line of the board, and at the intersection of the perpendicular *l.*, commence a line to V. 2, for the foot of the ideal parallelograms K. From B. and R., which represent on the line of contact the height of the lines G. M., *fig.* 2, produce lines towards V. I. till they touch the perpendicular *l.*, and from their places of contact return two lines to V. 2, which on their passage over the perpendiculars *n. o.* will give the angles O. Z. Next through O., and from the angle made on the perpendicular *l.*, by the transit of the ground-line of the target, draw

the inclined line X., which is continued upwards till it touches the vanishing line Z. at V. 3, where it marks the upper vanishing point for the face of the board. Again, draw a line from O. to V. 1, which gives the top of the board; and another from the intersection of the perpendicular *a.* by the ground-line, to be carried to V. 3, will finish the outline of the front of the board. Also from the angle O. draw a line through the angle Z., which falls upon the perpendicular vanishing line Z. out of the plate, and where they meet will be the vanishing point for the upper and lower short lines that mark the thickness of the board. We will call this vanishing point, although not seen, V. 4; to which, from the intersections of the perpendiculars *a. l.* on the ground-line, are to be drawn lines for the two lower corners of the board. These are defined, first, by the line Y. brought from V. 3, through the angle Z. made on the perpendicular *o.*; and at the place where it meets the line that proceeds from the nearest lower corner of the board to V. 4, another line must be drawn to the vanishing point V. 1. The squares may now be transferred from the line of contact and the perpendiculars in the usual way, noticing that from the points where the perpendiculars *a. b. c. d.*, &c., meet the ground-line, the lines proceeding from them are

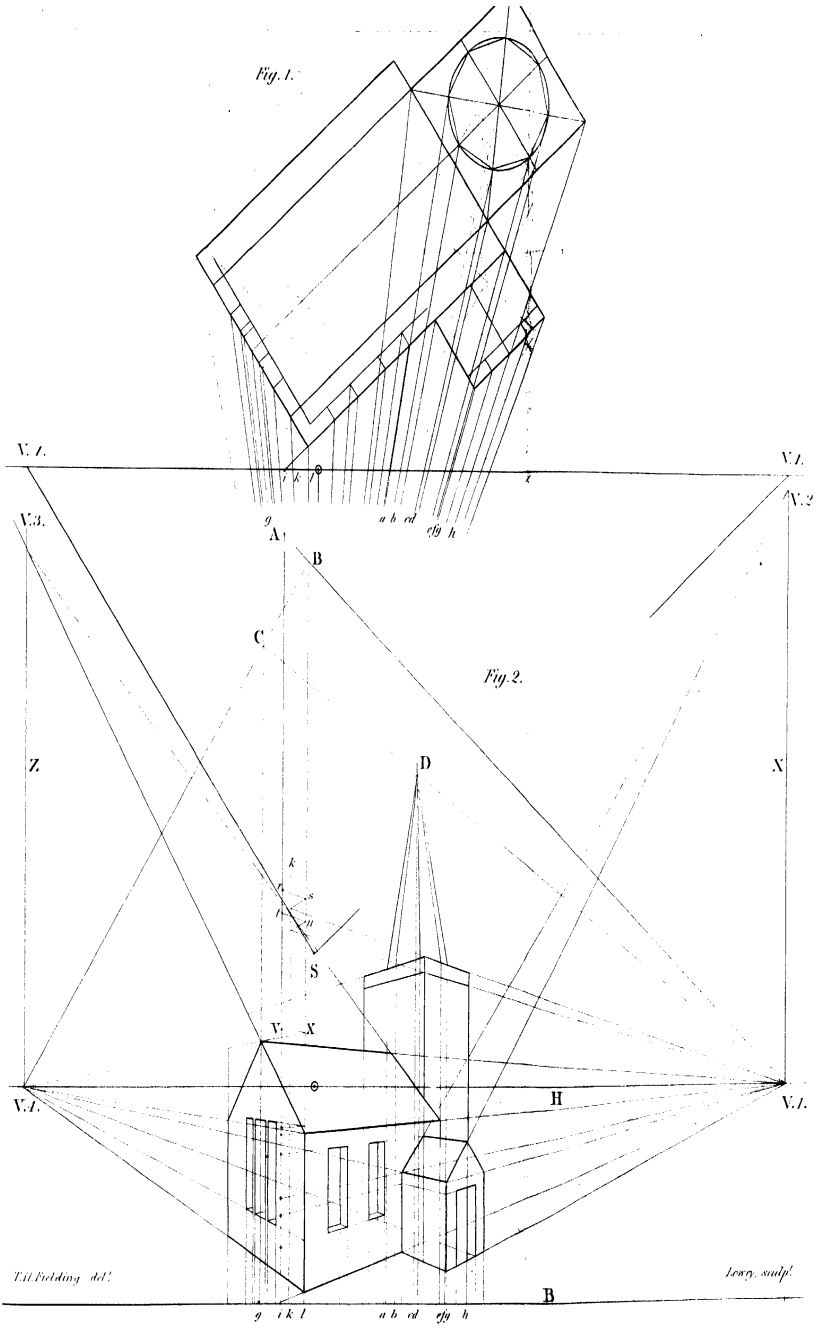
to be carried to V. 3., their proper vanishing point. When the squares are constructed, the two ellipses E. F. may be drawn through the places on the squares that answer to the same places on the corresponding squares of *fig.* 1.

PLATE XIV.

It is required to produce the perspective drawing of a church, with its porch, a square tower, and an octagon spire, according to a given ground-plan as laid down in Plate XIV. *fig.* 1.

Note. The geometrical elevations, for want of space, are omitted; but as all the proper heights of the different parts of the building are assumed upon the line of contact, it is conceived that no inconvenience can arise from their absence.

In laying out the ground-plan, bring the lines that mark the breadth of the tower through the body of the church, within the sides to which they are parallel. The nearest, and from which visual ray *k.* takes its origin, will be found necessary for the formation of the tower. Let the plan of the spire be laid down on that of the tower, by first describing a circle, and afterwards converting it into an octagon, by crossing at right angles the centre or roof line of the church,



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which is continued through the middle of the tower. Thus, by means also of the two diagonals, which we suppose to have been previously laid down for finding the centre upon which the circle is turned, the eight sides of the octagon are produced. From the five angles of it that would be visible at the station, and also from the centre, the visual rays are to be carried down to the station S. The ray from the centre of the circle is to produce the apex of the spire. The windows, door, &c., need not be described, having been already worked on former plates. It may be remarked, that the centre line in the plan of the porch standing perpendicularly to the body of the church is for its roof.

We will suppose the whole of the visual rays, vanishing points, point of sight, &c., transferred to the base line in *fig.* 2., and the heights placed upon the line of contact *i.* For example, the first dot from the base for the window sills; the second, for the top of the door in the porch; third, for eaves of the roof of the porch; fourth, for window tops on the front of the church; fifth, for the eaves of the church; sixth, for the tops of the windows at the east end. V. on the line of contact, for the height of the church roof, which is first to be carried to X. and thence to V. 4., marking the height of the roof

PLATE XV.

POLYGONAL columns, towers, turrets, &c., are most conveniently worked from a circular ground-plan, on which is to be inscribed the number of sides that the original object may possess, every angle visible to the spectator sending visual rays to the station, intersecting the picture, and requiring a vanishing point for each face of the polygon when none of the sides are parallel to each other; but where there are two faces regularly opposing through the figure, as in the subject of the present plate, one vanishing point will always serve two sides, as the point of sight for the sides 3. and 9., *fig.* 1.; which are perpendicular to the picture, V. 2. 8., for the sides 2. 8.; V. 10. 4., for the sides 10. 4.; V. 1. 7., for the sides 1. 7.; and V. 11. 5., for the sides 11. and 5. The sides 12. and 6. being the parallel to the picture, of course do not require any vanishing point. In the example before us, the nearest face of the column

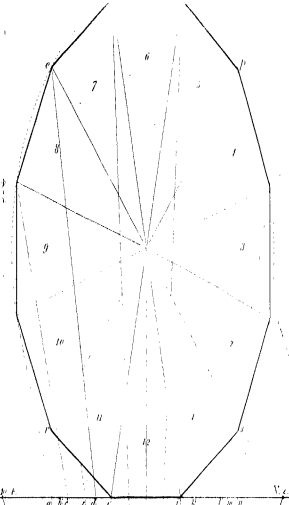

Fig. 1.

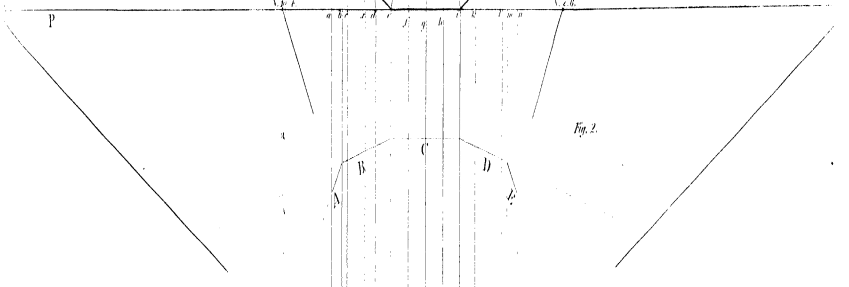

Fig. 2.

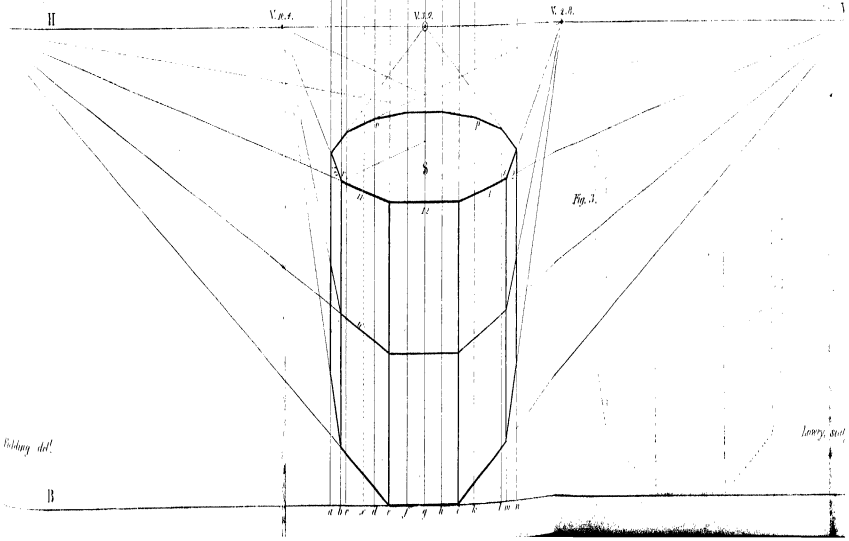

Fig. 3.

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is brought close to the picture, to avoid the necessity of using a line of contact, and diminish the number of references; thus also the perspective representation is obtained on a larger scale. The same has been done in the following plate of the winding stairs, for which this subject has been arranged to serve as a leading lesson. Whenever it may be necessary to work these or similar subjects at a distance from the picture, no difficulty can occur to the student who has paid attention to the first three Plates, with regard to the difference of arrangement for any given distance of the original objects from the plane of delineation. In *fig.* 2., the diagonals *r. p. o. s.* are drawn from the angles that are represented in *fig.* 1. by the same letters, thus giving in the easiest mode the perspective centre of the top of the column: and it may be here noticed, that whenever diagonal lines will give the centre of an object in an elevation or ground-plan, they will also give the perspective centre when the angles from which they are to be drawn are placed in perspective. This is exemplified in *fig.* 2., where a diagonal line is drawn from *r.* to *e.* on the face of the column marked 11.: it is crossed by another from the opposite angles of the same face, and their intersection at *u.* will be found to fall precisely upon the perspective centre, as given by the

varied operations of the ground-plan and vanishing points working together. The line round the middle of the column, *fig.* 2., dividing it into two equal portions, is placed to shew that the diagonals intersect at the proper point. The lines A. B. C. D. E. are added, to give the appearance that the column would take above the horizontal line at the height laid down.

When a circular column is required, the circle (or rather ellipsis when placed in perspective) must be finished by hand. In the construction of circular objects, it is perceptible that a polygon with a large number of sides would leave little for the hand to finish; and no other mode of discovering its perspective angles would be so safe as to rely on the perpendiculars deduced from a well-arranged ground-plan for their several points of union.

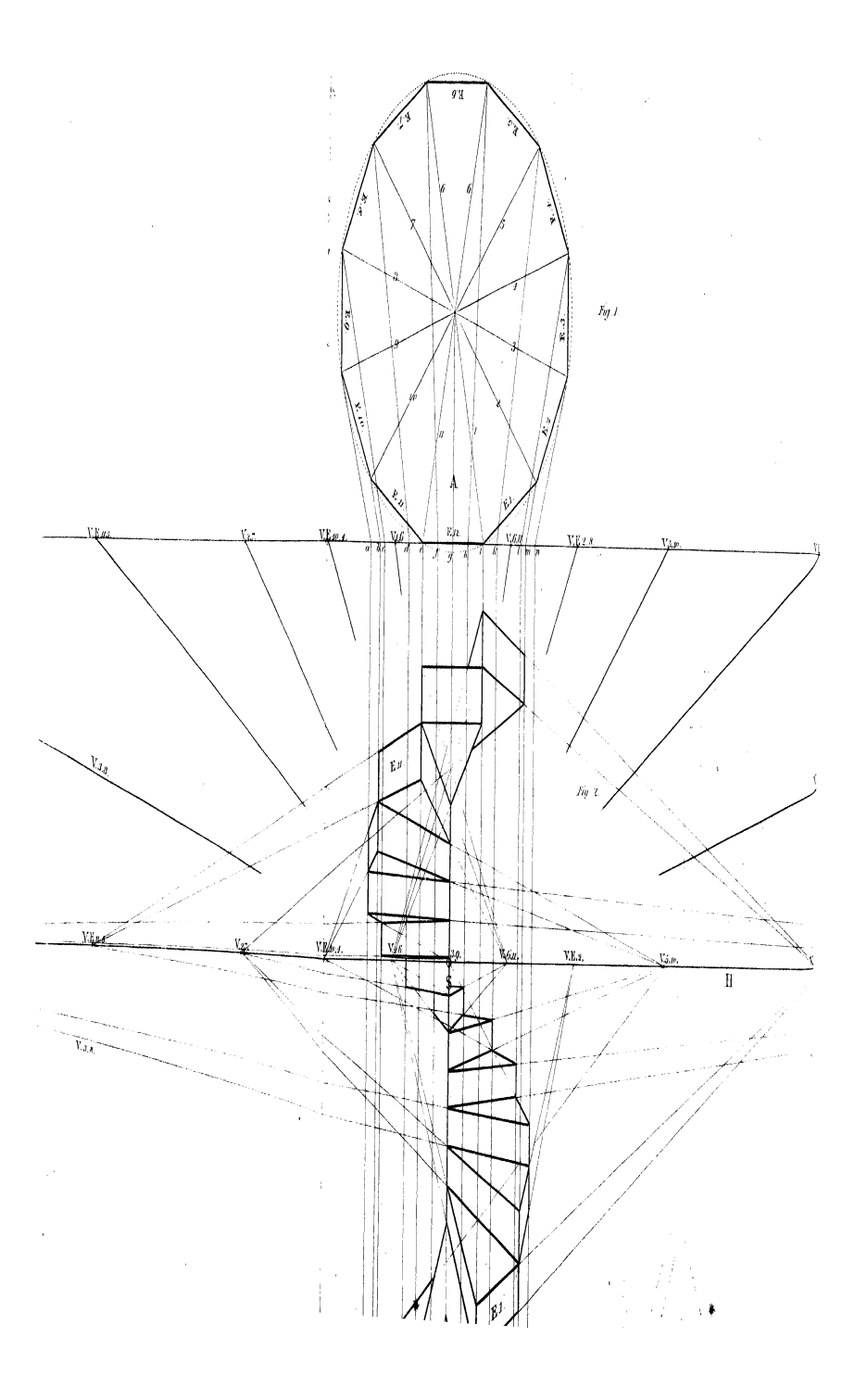
Fig 1
A
Fig 2
H
S

PLATE XVI.*

THE perspective of a winding staircase, making a circuit of twelve steps, the nearest of which has its end parallel with the picture and in contact with it, is required.

Let the ground-plan be laid down as in the preceding plate, by converting a circle into a dodecagon and carrying rays to the station, which for want of space we have been obliged to place at S. in *fig.* 2.; but having no connection with the figure, and also by not drawing the rays down to it, all possibility of confusion is avoided. Place the line which represents the picture parallel and in contact with E. 12., the

* An unacknowledged copy of this plate having been published as the design of another person, the author of the present work is unwillingly compelled to put forward a claim to his own property, which he has every reason to believe perfectly original, not having seen one like it.—His was published with the first edition of the Synopsis of Perspective, in January, 1829, and the copy was *modestly* ushered into the world as a new performance in 1836, *about seven years after the original!*

nearest step; then the horizontal line H., *fig.* 2., and the perpendiculars *a. b. c. d. e. f. g. h. i. k. l. m. n.*; afterwards all the vanishing points for the fronts and ends of the steps. Let it also be noticed that the landing step A. and the highest step but one precisely over the step A. require no vanishing point, their ends being parallel with the picture; and also, that the steps marked E. 3. and E. 9., *fig.* 1., having their ends perpendicular to the picture, will take the point of sight for their vanishing point. When the vanishing points are all correctly arranged, the work will proceed with much ease; and should the student make any mistake it will immediately detect itself, so that he runs no risk of overlooking an error in the course of the work.

Let the height of E. 1. be assumed on the perpendicular *i.* *fig.* 2., and thence draw two lines to V. E. 1., its proper vanishing point. From the point where the upper line intersects the perpendicular *m.* draw a line to V. 2. 7., and also two lines from the nearest corner of the step on the perpendicular *i.* to the vanishing point V. 1. 6. By this we not only complete the step, but also get its height, and that of all the other steps at the centre of the pillar, represented by the perpendicular *g.*, as it follows, that all the steps at the centre being at the

same distance from the eye, must appear of equal heights.

With the compasses mark the height of each step on the centre vertical line *g.*, and through each division of this centre-line draw others to their respective vanishing points: as V. 3. 8. (this occurs out of the plate), V. 4. 9. (this also is out of the plate), V. 5. 10., V. 6. 11., and V. 1. 6. These points are for the fronts or longest sides of the steps. The vanishing points marked V. E. 11. 5., V. E. 10. 4., V. E. 3. 9., V. E. 2., and V. E. 1., are for the ends or shortest faces of the steps, marked E. 2. and E. 8. These points will bring all the ends of the steps into their exact places, if the previous work has been correctly drawn, affording an agreeable proof of the precision with which this system of perspective performs its operations, in the accurate junction of all the angles with each other at their particular places on the perpendiculars stationed to receive them.

When the student has gone through the preceding lessons, he will be able to judge of the work that would be requisite for a perspective view of one of the many beautiful cathedrals existing in Great Britain. How many plans, not merely of the foundations, but at every height, where the building or its mouldings

make the smallest alteration by advancing or retreating, wherever the buttresses increase or diminish, wherever there are niches, canopies, or shrines for saints, the flying buttresses, perhaps highly ornamented on their sides and the soffits of their arches; again, the plans of the clustered columns with their wreathed or zig-zagged capitals; for turrets, pinnacles, crockets, and those branches of foliage that terminate the pinnacles called finials, with all the variety of shapes to be found in the mullions and tracery of the windows, &c. &c. To these plans must be added correct elevations and admeasurements of every minute part, with all their heights, their distances, and angles made with the picture, &c. To say such a drawing is impossible would be saying too much: but all who have given perspective any consideration, must be aware of the infinitely complex nature of the work when carried into execution, at every point and through it smallest details; and how much more desirable it would be to take the leading lines only for the different parts, and trust to the decision of the eye for filling up the intervals. In short, at all times very much must be left to the hand, as the instances are exceedingly rare where a draughtsman can have the opportunity of getting any of the requisites above mentioned, should he even be inclined to make the trial.

In concluding this division of our work, it may be permitted to revert to a subject already touched upon in the Introduction, of too important a nature to need any apology for its repetition, and to lay before the student part of the statement as it exists in Mr. Kirby's Perspective,* a work valuable in every respect, except where he allows, and seems to think it necessary, to swerve from the strictness of mathematical exactness. But, in the end it will be clearly

* He says that objects "are to be drawn as they appear to the eye, under the most pleasing and agreeable shapes; and if this is not clear enough, the following instances may perhaps more fully explain my meaning. Suppose a family picture were to be drawn with several figures, and as near as possible to what are called the strict rules of mathematical perspective: then, indeed, the figures near the middle of the picture would appear to be correctly drawn, but those which had the misfortune to be placed near the edges of the frame would appear like so many anamorphoses or deformations. Now this, I presume, would be displeasing to every one, and particularly to those whose real figures they were intended to represent: and I am persuaded that it would be no great satisfaction to any lady or gentleman, were the painter to assure them that they were only distorted by the true principles of perspective; but if they pleased to peep through a pin-hole at some distance, they might then see themselves drawn to a mathematical exactness, &c. If, therefore, the human figure must not be represented according to the strict mathematical perspective rules in a portrait picture, but must be left to the discretion of the artist, then this is one instance of the necessity of deviating from them upon some particular occasion, in order to avoid those disagreeable and unnatural shapes, which would be the unavoidable consequence of adhering too closely to them on all occasions."

perceived, that his ideas in this respect are founded upon false principles: though nothing is more certain, than that a distortion of parts will appear when the eye is placed too near to one part of the subject, the other of course receding and lessening, in a proportion always varying according to the distance of the station. For example, we will suppose a figure reposing on a sofa, and some one about to make a sketch placed almost close to his feet. If the proportions of the head and feet be compared, it will be found *practically*, and without the least reference to rules, that the disproportions are quite as alarming, or more so, than any which might take place in the perspectively constructed picture, as imagined by the writer above quoted. Yet no artist could ever think of choosing such a position from which to sketch a figure; a position that would make the feet appear three or four times the length of the head: but, on the contrary, would place himself at a sufficient distance to prevent those extraordinary distortions which a bad choice of place will invariably give. In fact, this whole question is resolvable simply in choice of position; and it never can be conceded to falsify mathematical truth, in order to cover the mistakes of those, whose duty it is to obviate difficulties by legitimate means, rather than in such a manner to sap

the first principles of science. A collection of figures in a picture might appear disproportioned, either wholly or in parts, if seen only in outline, by one not sufficiently aware of the powers of perspective to make the proper allowances; but let those outlines be filled up with colouring and effect in exact conformity to the principles of aerial perspective, and let the eye of the spectator be fixed at the precise station from whence the whole was drawn, and all these seeming distortions would be no longer such, but the verisimilitude would be established in the mind, by that same unconscious judgment that sees a cathedral in the distance like a speck, and a cabin on the fore-ground occupying a space in our vision a thousand times greater, yet knows the immensely larger dimensions of the distant speck, by laws not necessary here to elucidate, but which practically every one is master of.

The inconvenience sought to be remedied by this attempt to mix up truth and error is, that different persons cannot look at the same picture at the same time, and see it *correctly* representing to all of them, that which it professes to represent. This we may venture to admit at once, if we go to perfect strictness, as absolutely impossible where *solid body* is represented upon *flat surface;* but the student in

perspective must not be perplexed on this account, for although he cannot have an absolutely perfect representation for more than one spectator at a time, he has the same consolation which a mathematician has in regard to the impossibility of squaring the circle, &c., the indefinite approximation to the truth, which leaves error so minute, as to be entirely beyond the reach of the most acute perception of the human senses. This approach to truth is to be gained by a longer distance between the station and picture; and though it will be perfect only to one spectator, yet others may view it at the same time and not feel the error occasioned by a short distance, either to the right or left, from the exact point of view.

Thus it is evident, that there is nothing startling or distorted in perspective, but in its exaggerated state; and when it is considered that our sight is a perspective instrument, by which we see all objects perspectively, and in no other manner, we cannot but be reconciled to the strictest laws of that science, which explain the governing principles of a sense that affords to us the purest and least alloyed of all our enjoyments.

ON THE

PERSPECTIVE OF SHADOWS.

In the former edition of this work, every thing relative to the perspective of shadows was omitted, from a conviction that very little to the purpose can be given in the shape of diagrams. This will be immediately comprehended, if we imagine the shadow of a figure, an animal, a tree, or a building, thrown upon an uneven surface, perhaps gently undulating in every possible direction.

Some have written voluminously on the perspective of shadows; but the amount of the whole goes into a small compass, *viz.* the projection of the shadow from a regularly formed object, as a cube, prism, &c., upon a *plane surface*, inclined or level.

Architects have a rule for their shadows which saves them much trouble, and, besides, is attended with some advantages, *viz.* to cast the shadow with

a breadth equal to the projection which throws the shadows; thus, when a moulding, a pilaster, or a cornice, stands forward a foot or more from the building, let the shadow be made at the same depth or breadth; or in other words, if the projection be supposed a quarter of an inch (by scale) in advance, let there be a shadow a quarter of an inch broad on the flat surface where it falls, which is done by supposing the sun at an elevation sufficient to permit this arrangement of light.

Shadows projected by the sun are equal throughout—they neither diminish or increase in breadth, either by length or distance, except in such manner as the objects which cast the shadow are diminished: on the contrary, artificial lights throw shadows that widen or diminish as they leave the object, occasioned by the light proceeding from a small point, or a mass larger than the object which receives it. For example:—two posts placed upright in the ground will, in sunshine, project two shadows parallel to each other; but not parallel under the influence of artificial light. If the light be small or large, the shadows occasioned by it will be thrown out in every direction as from a centre: this cannot happen from the light of the sun.

It was the practice of many of the best historical

painters to have their groups of figures modelled by persons retained for the purpose, arranged in the order in which they were to be represented, and subjected to a strong artificial light, placed at as great a distance as could be made effective;—by these means they obtained their shadows, although not perfectly correct where daylight had to be represented, yet much nearer the truth than by any other means could be procured. These groups might have been subjected to the light of the sun, but the shadows are too quickly changed by the earth's motion.

As a general rule it may be assumed, that shadows from artificial light are darker than those produced by the light of the sun, for these are greatly softened by the surrounding light of the sky, and other reflections; nor should the edges of shadows be too cutting or hard, whether from sunlight or that which is artificial, as a penumbra, or half tint, exists round every shadow, softening the transition, and in some manner blending the edges of the shade with the adjoining lights. On this account, shadows should not be too abruptly terminated, especially those produced by the sun, as shadows of daylight contain a much greater transparency than others. In short, general shadows are always to be preferred to particular shadows in painting; the latter, when strongly

defined, attract the eye as part of the subject, to the great detriment of more interesting matters; and on reference to the works of the best masters, we find that they avoided, as much as possible, the markings of definite shadows.

When it is necessary, as in the shadows of buildings and streets, they should be laid down with as much clearness or transparency, as will permit the character of every object on which they fall to be distinctly and accurately made out; and in these cases, the shortest and best method is to sketch them from nature, taking care not to fall into a mistake that has been made sometimes, when the draughtsman has occupied himself a whole day in sketching a town, and overlooked the change of position in the shadows between the morning and evening sun.

This subject cannot be better concluded, than by quoting the words of an excellent writer on perspective—the late Mr. Edwards, Professor of Perspective to the Royal Academy—who finishes the description of a very laborious process for finding the shadows of arches:—"It must be noticed, that the shadows of all curved lines are obtained by the same process which is employed to determine the perspective appearance of circles and curves; therefore if the shadows of curved lines are to be described accurately, the

shadow of the reticulation, which determines the perspective appearance of such curves, must serve as the guide for the delineation of such shadow. Although it must be confessed that the process is attended with such infinite trouble as renders it almost improper for the attention of the artist, it will, therefore, be enough for him to employ some general rules, which, with a good eye, will determine with sufficient accuracy all that will be necessary for his purpose." The reader, perhaps, need not be reminded that this difficult process, so concluded, is for the projection of shadows on a plane surface; upon an unequal surface, the operation is absolutely impossible.

AERIAL PERSPECTIVE, &c.

It is surprising how few of the writers on perspective have mentioned aerial perspective, as if it had no connection with the subject: and yet this is the most interesting division of the science. Lineal perspective goes no farther than to correct an outline; but much remains to be done, depending upon a skilful combination of the aerial with lineal perspective, before a picture can have any thing like the appearance of nature.

By a careful attention to aerial perspective, we may be always certain of making an agreeable picture, if not of succeeding in some of those striking appearances that seem to have destroyed all rule: yet these appearances, or effects, in their wildest moods, are subject to laws of their own, controlled again by the superior regulations of aerial perspective.

This division of perspective enables the draughtsman

to represent on a plane surface the various distances of objects from each other, and by a suitable gradation of lights, of shadows, and of colours, to give to mountains, rivers, trees, &c., a seeming magnitude very much superior to their real size in the painting, and to make them seem placed at any wished-for distance or proximity, by throwing over them a degree of air-tint, equivalent to the column of air between the spectator and the objects depicted.

Although we may suppose that a pure atmosphere is perfectly transparent and colourless,* yet there are so many vapours rising continually from the surface of the earth and waters, that all things, when removed to a very small distance from the eye, become more or less tinged by them. These vapours most generally have a blueish-grey tint. Of course, objects which are most remote, having the greater interposing column of air or vapour, will lose most of their force: that is to say, their lights will become reduced, their shadows considerably weakened, and their colours altogether, or very nearly, blended into one mass of blue or grey, so closely resembling the hue of the sky, or clouds, as scarcely to be distinguishable; but

* This is not admitted by some, who are of opinion that the atmosphere has a blueish-grey colour of its own, independent of circumstances.

as objects approach the front of the picture, the quantity of air-tint is diminished, and as their size increases, their lights, shadows, forms, and colours are more distinctly made out; in their lights we have more brilliancy, in the shadows increased depth, in their forms more detail and finish, and in the colouring a perfect separation of them from each other, by the nearly perfect absence of all tint, leaving to every object its own peculiar brilliancy.—(See Plates XVIII. and XIX.*) At times, in bright sunny weather with occasional showers of rain, the distances are so well made out, both by lights, shades, and local colours, that they will frequently appear (particularly in mountainous districts) to have made a great approach towards the fore-ground; yet in this case, under every favourable circumstance of light and shadow, there will operate a sufficient quantity of air-tint to set them precisely in the different distances at which they may be placed: and it is by this perfect adjustment of aerial to lineal perspective, so well understood by Claude Lorraine and many others, that a faithful representation of the scenery and exquisite effects of nature is to be expected.

* As the numbers have been omitted, the reader is requested to consider the two plates, *viz.* "Perspective of Light and Shade," and "Perspective of Colour," as those which should have been marked XVIII. and XIX.

The practice of drawing from nature is here indispensable to the student. His previous knowledge will receive rapid additions, and he will have an opportunity of seeing arrangements and combinations of aerial and lineal perspective, as well as of lights, shadows, and colours, that remain perhaps but for a few moments, yet which, during those moments, may convey volumes of instruction.

We will suppose the student about to sketch a view from nature: the subject, a landscape with ruins, &c. The outline must be made correct before any thought is bestowed on the effect or colour. If the weather-stains, shrubs, &c., occur on portions of the ruin standing at different distances, we must carefully mark these distances by a due proportioning of similar objects to each other. For example, the weather-stains produced by rain falling from the sills of two windows of the same size, must necessarily be reduced in a degree proportionate to the perspective reduction of the farthest window; and again, beneath a row of windows standing on a plane at an angle with the picture, an equal number of stains may be visible, not all perhaps of one length, but so nearly as to make it requisite to attend to the perspective of their terminations, that it may be seen how much nearer to the horizontal line those terminations have

approached than the windows from which they take their origin. When there are fallen masses of stones or detached blocks, every mass, if quadrangular, will have at least three vanishing points to be noticed, one for the upper surface, and two others for the two sides nearest the eye. Should the mass be irregular, and composed of regularly wrought stones with portions of mouldings upon them, attention to an endless number of vanishing points would be required to work the whole mass according to rule. But would it be worth the labour? Certainly not. It would be much better to sketch the mass freely, with a regard to all the tendencies of the principal lines; and very particularly should it be anywhere near or upon the fore-ground, on account of its increased magnitude.

A road or well-drawn path leads the mind agreeably into the subject by easy gradations, and where the perspective has been well adjusted, and every object upon it properly diminished according to their distance from the front, the effect is always pleasing. A road is of more value in a picture than a river, because it is more frequently from roads than upon rivers that our views and impressions of nature are derived. A road admits of a thousand picturesque irregularities, of which a river is incapable. The formation of wheel-ruts, the horse-track in the middle,

Fig. 3.

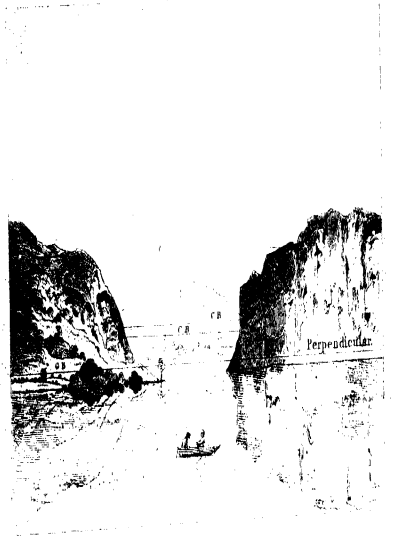

Fig. 1.

Fig. 2.

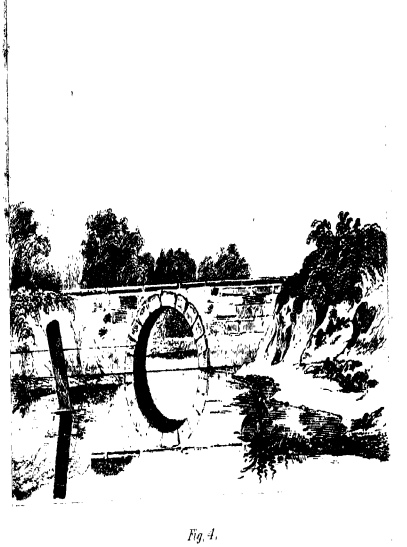

Fig. 4.

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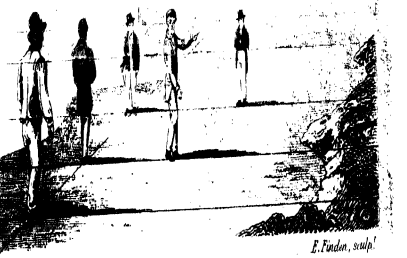

E.Finden, sculp.t

patches of vegetation, the ever-changing tints of the soil, the chequered lights and shadows thrown by neighbouring trees and bushes, besides the power of introducing an almost infinite variety of figures, give to the accurate draughtsman an opportunity for embellishment and finish in the perspective department, which a river with all its moving objects (although very beautiful,) will not allow. The student should be diligent in examining the different appearances made by roads upon surfaces that are dissimilar. A winding road on the side of a hill is very unlike the same on a level plain; and when a road takes its way directly up a steep ground in front, the width at the top will not be very much less than at the bottom, not having receded from the spectator perhaps more than half the distance it would have done upon level ground, or much less in very abrupt ascents. (Plate XVII. fig. 1.)

It might be supposed, amidst wild plants and creepers that shoot among the ruins, the rules of perspective would be lost; yet here, as in every other place, their violation would bear ample testimony to the unskilfulness of the draughtsman. When plants are upon a level with the eye, we see a regular intermixture of branches and leaves. When below the horizontal line, little more than the upper surfaces

of the leaves are seen; but when above, we not only perceive the greater part of their branches, but in addition, roots starting off the wall in every possible deviation from order and regularity. These three different positions have certain appearances that can only be well understood by frequent observation, as there is method to be found in all its irregularity, arising out of the laws of perspective. Attention must be paid to the proper diminution of the leaves as well as of the branches and roots, whose curves and angles are to be formed with nicety at the points where they take place. The student should also notice, that the trees have their trunks well diminished upwards, and that their branches receive not only their natural decrease as they leave the chief trunk, but also the perspective decrease occasioned by their distance from the eye. This, with attention also to the aerial perspective, *viz.* by giving the greatest power of light, shade, and colour to the nearest branches and clusters of leaves, and adding a proper quantity of air-tint to those which are at the back, will do much towards giving apparent magnitude: one of the most desirable properties that front objects can possess next to the fidelity of the detail.

Landscapes seldom look well without figures. If we suppose them to be placed with the draughtsman

upon a plain perfect level, and the artist upon his feet whilst making his sketch, the heads of all those figures which are also standing, and of his own height, will have their heads upon the horizontal line; those which are shorter than the person sketching, below; and those that are taller, of course, above his horizon; making it needful that the diminution in height occasioned by their different distances should be made at the feet only of those figures whose heads fall upon the horizontal line.* But should we suppose the student to be seated during the sketch, the head of every full-grown erect figure will appear above him: in this case, the figures will have to be shortened at the head as well as at the feet. The rate of diminution is ascertained by drawing a line from the head and feet of the nearest figure to the point of sight: these two lines will limit the perspective gradation of size for figures of the same height as the one from which the lines originate. This mode will serve equally for cattle, &c.; and one process will answer for the whole picture, by recollecting that figures, &c., which are of equal heights in the originals, are to be made of similar heights at the same distance from the fore-ground, whether they may be placed to the right or left of the centre of the picture.

* Plate XVII. Fig. 4.

When proper proportions have been given to the figures in the sketch, their colours, &c., may be introduced. Should the student, by a little inattention to the aerial department, make a small distant figure too prominent in effect for the objects around, it will stand forward in the picture, not as a figure of natural size, but rather as a dwarf, when viewed with regard to objects at the same distance which may be true in colouring and effect for their situations.

Nothing more promptly shews a wrong effect than a figure out of harmony with the rest of the picture, for it may, by having too much air-tint thrown over it, take the appearance of a ghost, or by receiving too little look like a fairy springing from the paper.

Few things add more to the beauty of a composition than reflections in water;* for as pure water has no colour of its own, it becomes, when tranquil, a mirror to every surrounding object. Regard must be had to the aerial perspective, colours, &c., when reflected in water, with as much attention to their distances as to the colours, &c., of the original objects which give the reflections. If there should exist the slightest

* Perfectly clear water will reflect every object near it, but will not shew any shadows that may fall upon it; whilst the contrary effect is seen on water that is turbid or muddy. The shadows of objects fall upon it as on the ground, and there are no reflections.

undulation or ripple, a large admixture of the tints of the sky takes place throughout the whole, weakening the power of reflection, and gently blending all things together, by a magical play and mixture of lights, colours, shades, and forms.

When objects are reflected in still water, the depth of the reflection will be precisely equal to the height of the object reflected, if it be in contact with the water. For example, a post standing in water will reflect a length equal to its height above it; or an arch, making a true semicircle in spanning a rivulet, will with its reflection become an entire circle. (Plate XVII. fig. 2.)

In a series of objects placed behind each other, as mountains, trees, &c., we may, for the reflection of every mountain or other objects, suppose the water carried on its own level to the central base of the mountain, and from this division of the mountain and water lay down its whole height for the reflection. Thus as the plane of the water would be constantly retiring in order to arrive at the central base of each receding mountain, these lines of demarcation would each stand a little higher on the picture as the distances of the mountains increased, and the reflections of their summits would appear arranged invertedly of very different relative depths, when compared with

the heights of the real mountains as seen against the sky. (Plate XVII. fig. 3.)

The large weeds that generally approach closely to the front of a picture should not be neglected. Among these there is great room for the display of perspective knowledge in some of its most agreeable forms. Suppose the burdock, the more humble colts-foot, or any other plant whose leaves are of sufficient size to bear characterizing: many of them are strongly marked by the fibre that proceeds from the footstalk through the middle to the point of the leaf, with numerous smaller fibres resembling veins radiating from the centre to its outer edges. When such leaves are lying on the ground in an horizontal position and not far from us, our first care will be to mark the central division or fibre in its proper place, *viz.* not in the middle of each leaf, but so situated that the nearer half of the leaf shall be made larger than the farthest; for the rule, that all things appear to diminish by distance, is to be regarded down to a blade of grass, when brought near enough to distinguish its component parts. The outer curvature of the two sides forming the complete circuit, the direction of the lateral veins or rays, and the varieties in these forms occasioned by their unequal and undulating surfaces, with all their different attitudes, are

to be diligently noted by a close attention to nature; for nature only can teach the high finish and delicacy in the construction of those ever-changing and elegant forms, of which the most elaborate perspective diagrams constitute little more than first lines.

Although some of the barren wastes and moors of Great Britain abound in scenes of a most unpromising kind, they will, at certain seasons and under favourable modifications of light and shadow, afford landscapes of a peculiarly picturesque description. Frequently we see on these extensive tracts warm, or silvery lights diminishing into shade and again suddenly breaking out, in the form of a brilliant ray, from some sequestered nook. Often a wreath of smoke floating along the sides of a hill, produced from the cottage of a solitary homestead, planted upon some small spot of greensward like an oasis in the desert; a single patch of corn with a few aged and stunted trees, or perhaps a hay-stack, marking by its diminutive size the scanty soil from which it has been gathered, will take an appearance of picturesque comfort by the contrast of surrounding sterility. Cattle placed in a vivid light, relieved by the sombre hue of the distant heath in shadow, or the effect reversed, make in such scenery very interesting ac-

companiments. Nearer at hand we see more distinctly broken ground interspersed with tufts of vegetation, gravel, or pieces of rock stained with moss and lichens, rising abruptly from the heath, or gently sinking into it amidst all the profusion of nature's wildest beauties; fern, harebells, the briar rose, the furze, and purple thyme; added to these we often find still pools of water and all the variety of aquatic plants, with the plover, heron, widgeon, or duck wheeling in the air or resting on banks of yellow sand, altogether forming a multitude of objects so diversified, that, under the harmonizing tints of autumn, a painter would require little else for a picture.

The effect of such pictures is dependent on the due arrangement of the aerial perspective: for we are aware by long habit, how many gradations appear in such scenery, very often defined by no other means than the shadows of clouds, scattered over the country at varied intervals, with degrees of intensity changing according to their different distances from the front, and yet which are generally adequate to the purpose of informing us of the nature of the ground, by shewing the ascents and depressions of its surface; but if to these be joined the accompanying lights, shadows, and colours produced by the forms and

qualities of the soil, or vegetation, aided also by a sky perspectively adapted to the subject, combinations may be created of such infinite extent, that to the student who has diligently cultivated the art, means are afforded of making sometimes a very pleasing picture out of what has apparently little or no material to work upon. In short, nothing should be considered beneath the attention of the student, or escape his notice. Practice in drawing will increase the power of vision, and give to him a habit of seeing more acutely and with greater precision than most others;* for it is of consequence to him to regard all things minutely and with unceasing observation, otherwise he can never be enabled to perceive many of those faint, but beautiful alternations of light and shadow sometimes impressing the face of nature like a passing thought, which scarcely moves the brow or curves the lip, and yet will give during its rapid course through the mind an intelligence to the countenance understood but indescribable.

* See Appendix, Note B.

ON THE

PERSPECTIVE OF COLOURS.

It has been already stated that the filmy mist which pervades the atmosphere at all times, and in all seasons, is the visible cause of that diminution in lights, shadows, and colours, called aerial perspective ; the first effect of which is to diminish the number of tints in any object. If in a tree, the front of a building, or any other object, we can count twenty or more distinct tints, a small remove or increase of distance will render many of them invisible, by causing them to merge into those to which they are similar, and another remove considerably farther will reduce the object to simply two colours, the colours of its light and dark sides. Thus the rule which forbids us to finish distant objects with any thing like particular detail, also forbids the enumeration of colours and tints in the same ; for all unnecessary finish destroys their distance,

and instead of appearing distant by being made small or misty, with too much detail they would take the character of foreground objects drawn too small and badly coloured. Yet there is a remarkable exception to this rule, often seen in the formation and colouring of objects which have their summits considerably raised above the plane of the earth's surface; for the superior thinness of the air at a moderate elevation will give to the tops of the mountains a distinctness, both in colour, light, shadow, and character, that their bases do not possess, although they may be several miles nearer to us, on account of the greater density of the air-tint in the plains. This is frequently the case with lofty buildings, especially in towns, where there is more vapour, not a little increased by the accidental circumstance of smoke, &c.

In the neighbourhood of the English Lakes, where the author resided many years, he has frequently been surprised at the extraordinary distinctness displayed on the summits of the mountains, particularly after rains followed by bright sunshine; at these times their bases would retain their proper perspective appearance, or perhaps a little increased, whilst the tops of the mountains seemed to display all the detail of particular formation of foreground objects, as a multitude of small stones, interspersed with patches of bare earth

and grass;—but notwithstanding these deceptive appearances, the law of diminution was not infringed, for these apparently small stones were huge masses of rock, reduced by distance into the semblance of coarse gravel, for the fractures in large or small masses are generally similar in substances of similar natures, as the meanderings of the smaller rills of water will produce a character and formation of shore or margin, agreeing with the banks of larger rivers that may happen to flow through ground of the same quality.

The following experiment, taken from Leonardi da Vinci's Fragments on Painting, conveys an excellent idea of some of the alterations occasioned by distance; he says, "to put into practice that perspective which teaches the alteration, the lessening, and even the entire loss of the very essence of colours, you must take some points in the country at the distance of about sixty-five yards from each other, as trees, men, or some other remarkable objects. In regard to the first tree, you will take a glass, and, having fixed that well and also your eye draw upon it with the greatest accuracy the tree you see through it; then put it a little on one side, and compare it closely with the natural one, and colour it so that in shape and colour it may resemble the original, and

that by shutting one eye they may both appear painted, and at the same distance. The same rule may be applied to the second and third tree, at the distance you have fixed. These studies will be very useful, if managed with judgment, where they may be wanted in the offscape of a picture. I have observed that the second tree is less by four-fifths than the first, at the distance of thirteen yards."

It will be found by observation, that there is a great inequality in the perspective lessening of colours, as it is constantly happening that different colours of equal strength and tone will stand near each other, the one very visible, whilst the other is wholly lost;* as green and red, which may be perfectly equal in power, yet the red tint will be visible at a greater distance than the green. This is occasioned by the green having blue in its composition, a colour that readily assimilates with the air-tint, whilst red, having nothing in common with the colour of the atmosphere, preserves its distinctness much longer, or in other words requires a greater column of air to reduce it to the same state as the green. This is applicable to all colours according to their qualities, and it may

* By equality of strength or tone, we mean that state in which two colours, widely differing from each other may exist: as purple and orange, which, being reduced to a shade-tint, become both equal in power.

be taken as a general rule that the darkest colours are the first to disappear.

The following observations from Leonardi da Vinci are worthy of close attention: "the air which is between the earth and the sun when it rises or sets, will always dim the objects it surrounds more than the air anywhere else, because it is whiter."

"Those parts of objects which first disappear in the distance are extremities similar in colour, and ending one upon the other, as the extremities of an oak tree upon another oak similar to it. The next to disappear at a greater distance are objects of mixed colours, when they terminate one upon the other; as trees, ploughed fields, walls, heaps of rubbish or of stones. The last extremities of bodies that vanish are those which, being light, terminate upon a dark ground; or being dark, upon a light ground."

"When the sun is in the West the vapours of the earth fall down again and thicken the air; so that objects not enlightened by the sun remain dark and confused, but those which receive its light will be tinged yellow and red, according to the sun's appearance on the horizon. Again, those that receive its light are very distinct, particularly public buildings, and houses in towns and villages, because their shadows are dark; and it seems as if those parts

which are plainly seen were coming out of confused and undetermined foundations, because at that time every thing is of one and the same colour, except what is enlightened by the sun."

"The setting sun is a beautiful and magnificent object, when it tinges with its colour all the great buildings of towns, villages, and the tops of high trees in the country. All below is confused and almost lost in a tender and general mass; for, being only enlightened by the air, the difference between the shadows and the lights is small, and for that reason is not much detached. But those that are high are touched by the rays of the sun, and, as it was said before, are tinged with its colour; the painter, therefore, ought to take the same colour with which he has painted the sun, and employ it in all those parts of his work which receive its light."

These exquisitely beautiful effects of aerial perspective cannot be explained by language, thus we are again compelled to recommend that mode of study which is the best: to study nature closely, with occasional references to the works of the most eminent artists, ancient and modern, and by these means to form a style, through which we may be enabled most suitably to express our ideas.

APPENDIX.

NOTE A.

As there are yet innumerable MSS. lying buried under the accumulated dust of ages in the vast libraries of Europe and elsewhere, it is not impossible but from amongst them some of the missing books on Painting and Perspective may be recovered. We have given the following list of known writers, whose works are at present considered lost, from the third chapter of Franciscus Junius, on the ancient art of Painting, which may afford some small assistance to those who have the opportunity and inclination to dig in the mines of antiquarian research. The above work was first published in Latin, but, at the request of the Countess of Arundel and Surrey, was republished in English. It is dated Arundel House, March 28, 1638.

"ADÆUS MITYLENÆUS, his books of Statuaries are quoted by *Athenæus*, lib. xiii., Deinosoph. cap. 8.

"ALEXIS, the poet, made a comædie, intituled Picture: and the argument of that poeme seemeth to agree with the argument of the writers here named, if we may make conjecture of the whole poeme by the place alledged out of it

in *Athenæus*, his Deipnosophists, lib. xiii. cap. 8, wee may judge the same of PHERECRATES, his painters, quoted by the same *Athenæus*, lib. ix. cap. 11; as also of DIPHILUS, his painters, mentioned by the same author, lib. vi. cap. 4; ALEXANDRIDES, his painters, are quoted in *Pollux*, his *Onomast*, lib. x. cap. 14; Nonius Marcellus bringeth forth many places out of POMPONIUS, his painters.

"ALCETAS hath written of the donaries* or gifts offered unto Apollo in his Delphik Temple.—*Athenæus*, lib. xiii. cap. 6.

"ANASIMENES hath written of the auncient pictures, see *Fulgentius Placiades*, lib. iii. Mytholog. in Actæone.

"ANTIGONUS, the statuarie, made bookes of his art, saith Plinie, lib. xxxiv. cap. 8, and there seemeth also to have been another.

"ANTIGONOUS, whom the same Plinie, lib. xxxv. cap. 10, reporteth to have written a treatise of Picture.

"ARISTODEMUS CARIUS hath particularly set down the endevours of all them that have advanced the art of Painting, reckoning up also what kings and republikes have been well affected towards the said arts: see *Philostratus* in Procemio Iconum.

"ARTEMON his book of Painters, is quoted by *Harpocration*, where he speaketh of Polignotus.

"CALLIXENUS hath written a catalogue of Painters and Statuaries, and Photius telleth us, that the twelfth booke of Sopater, his choice histories, was collected out of Callixenus, his worke.

* Amongst the gifts, or votive offerings to the temples, Paintings were not uncommon.

"CHRISTODORUS, his description of the statues that were at Constantinople, in a publike place named Zeuxippus, is mentioned by *Suidas.*

"DEMOCRITUS *Ephesius* hath described the temple of Diana Ephesus: see Laërt. lib. ix. in *Democritus:* and *Athenæus,* lib. xii. cap. 5.

"DURIS, of the Art of Painting, is quoted by Laërt. lib. i.

"EUPHRANOR *Isthmius,* a most famous painter, hath written of Symmettrie and Colours: see *Plinie,* lib. xxxv. cap. 11.

"HEGESANDER, *Delphicus,* his commentarie of Images and Statues is quoted by *Athenæus,* lib. v. cap. 13.

"HIPPIAS *Elëus,* a famous Sophist, disputed about Picture and Statuarie: see Philost. lib. i. *de vitis Sophistarum.*

"HYPSICRATES hath written of Picture. *Laërt.* lib. vii. in *Chrysippus.*

"JAMBLICHUS, his worke of Statues hath been confuted by *Johannes Philoponus.* Photius speaketh of them both.

JUBA, the king of Mauritania, (of whom see what Plinie saith, Nat. Hist. lib. v. cap. 1.) hath written of Painters, and the eighth book of that same worke of his, is quoted by *Harpocration* in *Parrhasius:* the said king wrote also of the art of Painting, as we learne out of the same *Harpocration* in *Polygnotus.* Photius likewise, in the choice histories of Sopater, quoteth JUBA, his second booke of the art of Painting.

"MALCHUS *Byzantius* hath written about the firing of the publike librarie at Constantinople, and about the statues that were in a place known by the name of Augustæum: see *Suidas.*

"MELANTHIUS, a very renowned Painter, hath written about the Art of Painting. See *Laërt.* lib. iv. in *Polemon.*

"MENÆCHMUS, the Statuarie, hath written about his owne art, saith Plinie, lib. xxxv. cap. 8.

"MENETOR, of Donaries, is mentioned by *Athenæus,* lib. xiii. cap. 7.

"MENODOTUS *Samius,* hath written of the things consecrated in the temple of Juno, at Samos: see *Athenæus,* lib. xiv. cap. 20.

"PAMPHILUS hath written of the Art of Painting, and of famous Painters: see *Suidas.*

"POLEMON hath written a treatise of Painters to Antigonus, quoted by Athenæus, lib. xi. cap. 6. POLEMON, of Pictures, is mentioned by Laërtius, lib. vii. in Chrysippo: he hath also written five bookes of the Donaries offered in the Castle at Athens; see *Strabo,* lib. ix. *Geogr.* as likewise another treatise of the pictures that were at Athens, in the porch of the temple of Minerva, see *Harpocration:* furthermore hath he written a treatise of the pictures that were at Sicyon; see Athenæus, lib. xiii. cap. 2, and this Polemon doth seem to be the same that is so often mentioned by *Clemens Alexandrinus,* in Protrept., and by Laërtius, lib. ii. in Aristippus.

"PORPHYRIUS hath written of statues, and Stobæus doth quote something out of him, cap. xxv. *Eclogarum Physicarum:* but it is thought that this *Porphyrius* is the same with Malchus named above.

"PRÆSITELES hath written five volumes of the noble works that were in the whole world. *Plin.* lib. xxxvi. cap. 5.

"PROTOGENES the Painter left two bookes of the Art of Painting and of Figures: see *Suidas*.

"THEOPHANES of the Art of Painting is mentioned by *Laërt.* in Aristippus.

"XENOCRATES the Statuarie made bookes of his art, saith *Plinie*, lib. xxxiv. cap. 8, and againe, lib. xxxv. cap. 10, Antigonus and Xenocrates, saith he, have written of Picture."

NOTE B.

That sight is a habitude, perfected by practice, is certain; for children are long in forming true ideas of distance, and it is well known that animals brought up in a dark place, as stables, or byres, will, the first time they are turned out into daylight, run against walls, trees, and other objects which they had not before seen, and afterwards avoid them, till by practice they acquire a correct idea of their distance. In infancy, children find a certain number of steps necessary to reach an object, but when this object is placed farther from them, or, in other words, has in some measure changed its appearance, by an apparent reduction of size, and by having its parts less defined, they find more steps necessary to reach it; and as the smallest increase or decrease of distance changes the appearance of objects, the eye quickly applies this new knowledge to all things it sees, and by an aptitude which it seems to have above all the other senses, is enabled in a very short time to make correct allowances for adventitious circumstances, as the difference occasioned in distances by hazy or clear weather; at the same time the eye is also gaining a true idea of magnitude, for a shepherd and

his dog have always the same relative proportions, whether near or at a distance, if together, or should they be separated so far from each other that the dog will appear as large as the man; the eye cannot be deceived, because certain appearances in both indicate the greater distance of the man and the much less distance of the dog, and by a parity of brief and unconscious reasoning, the eye forms true conclusions respecting the distance, size, and qualities of objects too large to be seen but at great distances, as mountains, rocks, and other natural or artificial phenomena.

One of the most conclusive evidences that sight is an acquirement through the agency of an organ adapted to the purpose, is to be found in Cheselden's Anatomy of the human body, and is also a most interesting document; it consists of observations made by a young gentleman who was born blind, or lost his sight so early as to have no recollection of ever having seen, and who was couched at the age of between thirteen and fourteen years. The operation was performed by the celebrated anatomist above mentioned.

"When first he saw, he was so far from making any judgment about distances that he thought all objects whatever touched his eyes, as he expressed it, as what he felt did his skin, and thought no objects so agreeable as those which were smooth and regular, though he could form no judgment of their shape, or guess what it was in any object that was pleasing to him: he knew not the shape of any thing, nor any one thing from another, however different in shape or magnitude, but upon being told what things were, whose form he knew from feeling, he would carefully observe, that he might know them again: but having too

many objects to learn at once, he forgot many of them, and, as he said, at first he learned to know, and again forgot a thousand things; one particular only, though it may appear trifling, I will relate: having often forgot which was the cat and which the dog, he was ashamed to ask; but catching the cat, which he knew by feeling, he was observed to look at her stedfastly, and then setting her down, said, 'I shall know you another time.' He was very much surprised that those things which he had liked best did not appear most agreeable to his eyes, expecting those persons would appear most beautiful that he loved most, and such things be most agreeable to his sight that were so to his taste. We thought he soon knew what pictures represented which were shewn to him, but we found afterwards we were mistaken, for about two months after he was couched, he discovered at once they represented solid bodies, when to that time he had considered them only as party-coloured planes, or surfaces diversified with variety of paint; but even then he was no less surprised, expecting the pictures would feel like the things they represented, and was amazed when he found those parts, which by their light and shadow appeared now round and uneven, felt only flat like the rest, and asked which was the lying sense, feeling or seeing?

"Being shewn his father's picture in a locket at his mother's watch, and when told what it was, he acknowledged a likeness, but was vastly surprised, asking how it could be, that a large face could be expressed in so little room, saying, it should have seemed as impossible to him, as to put a bushel of any thing into a pint.

"At first he could bear but very little light, and the things he saw he thought extremely large, but upon seeing things larger, those first seen he conceived less, never being able to imagine any lines beyond the bounds he saw; the room he was in, he said, he knew to be but part of the house, yet he could not conceive that the whole house could be bigger.

"Before he was couched, he expected little advantage from seeing worth undergoing an operation for, except reading and writing, for he said he thought he would have no more pleasure in walking abroad than he had in the garden, which he could do safely, and readily. And even blindness, he observed, had this advantage, that he could go anywhere in the dark much better than those who can see; and after he had seen, he did not lose this quality, nor desire a light to go about the house in the night. He said every new object was a new delight, and the pleasure was so great, that he wanted words to express it; but his gratitude to his operator he could not conceal, never seeing him for some time without tears of joy in his eyes and other marks of affection, or if he did not come at any time when expected, he could not forbear crying at his disappointment.

"A year after first seeing, being carried upon Epsom Downs, and observing a large prospect, he was exceedingly delighted with it, and called it a new kind of seeing. And now being lately couched of his other eye, he says, that objects at first appeared large to his eye, but not so large as they did at first to the other; and looking upon the same object with both eyes, he thought it looked about twice as large as with the first couched eye only, but not double, that we can any ways discover.

"I have couched several others who were born blind, whose observations were of the same kind; but they being younger, none of them gave so full an account as this gentleman."

It seems evident, from the above, that by whatever means the sense of seeing is conveyed to the soul, altogether it is an acquired knowledge through an organ adapted for the purpose; for the rays of vision, or the reflection of an object, will impinge on the retina of an idiot with all the force they may affect the eyes of the sensible, yet for want of intelligence sufficient to rightly receive those impressions, they are, in a great measure, as much thrown away as a reflection in a mirror, or merely serve to inform the dull possessor of a few localities, the presence or absence of his food, or the grand division of day and night.

ADDITIONAL REMARKS ON SKETCHING, OR PAINTING FROM NATURE.

THERE is a reasoning power visible in the construction of all things and in their modes of being or existing, which may be termed general principles, and of which the young artist must become possessed as soon as possible; these general principles belong to classes; there are also particular principles which belong to the individuals or items of a class, and these, &c. taken together constitute the philosophy of painting.

Although the classes are very numerous (including all things natural and artificial), yet the enumeration of a few will give a sufficiently correct idea of the whole, and the *modus operandi* of the principles in the class to which they belong, as well as on the individuals of a class. Amongst these principles are to be reckoned construction, strength, motion, stability, vision, colours, lights, natural history, geology, taste, expression, &c. &c. &c. These, and what are included in the many et-ceteras, comprehend the kind of knowledge which is to give the artist that rank in his profession which it is so desirable to hold.

In trees, and all other vegetable productions, we find that the chief stem is made sufficiently strong to carry the top weight; and we also find the stems and branches diminished

as the weight they have to carry diminishes. If we take a class out of this large family, we find that it is particularly fitted for the climate to which it belongs: the evergreens shew this in a remarkable manner, as those like the Norwegian or Scotch fir, which have often to bear a large load of snow on their heads; if we compare these with the evergreens of the warmer latitudes, we find a striking difference in the insertion of their branches. The branches of the Scotch fir are greatly strengthened at the point of insertion into the trunk, whilst the southern evergreens have their branches no more strengthened at their insertion than the deciduous trees of our own climate.

In animals that breathe we find principles of construction common to all, *viz.* a roomy chest; open nostrils; leg above the knee or hough strong; below the knee, round and small; foot, possessing the principles of strength and elasticity; head not large; forehead expansive; eyes bright and well open; muzzle altogether rather small; and these things, with many other points, are modified in individuals to suit their general wants and habits; the bull and the greyhound are alike in general construction, but very different in particulars; the great strength of neck and shoulders in the bull are admirably suited to his mode of defence or warfare, and the modifications in the construction of the greyhound are equally admirable and as well adapted to his habits; and we find the same nice and refined adaptation of all things living or inanimate to the places they hold in the creation. We will add another illustration from artificial objects. In vessels we see the proportions of a frigate, a sailing-boat, or a first-rate, widely differing, yet they possess

a common form, equally necessary to the three, *viz.* a shape that will allow swift motion through the water, and secure stability under the pressure of the wind on their sails; these are as essential to the fishing-boat as the first-rate, for neither could exist without them; after these we find particulars in each, expressly adapted to their wants and occupations, if the expression can be allowed, and without which they would not be complete either as a boat or as vessels of war.

If the student will attend to these things carefully, an immensity of labour will be spared to him, for every touch of his pencil, however slight, will carry an impress of nature; no flourishes or "spirited touches" are to be introduced to conceal ignorance, but every mark must express an idea, more or less developed according to the patience or hurry with which the work has been executed, and the knowledge of the fixed and invariable principles of things will render all comparatively easy to him, as in colouring, when we know that the *common* gradation of colours is from white, through yellow, then red, grey, purple, or dark blue into black, we are saved from the endless, fruitless, and vexatious trials that otherwise would have to be made, and the great loss of time and fame that must follow the want of this small item of practical knowledge.

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